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Vienna, 22-26 June 1987

WASTE DISPOSAL AND WATER TREATMENT IN SELECTED PRESERVED FOOD INDUSTRIES IN EGYPT*

by

Makio Nakashio
UNIDO Consultant

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ACKNOWLEDGMENTS

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The author " Makio Nakashio" wants to express his gratitude to the help of Dr. Ahmed Amin Ibrahim (3) GOFI as well as of Mr. Stharwat Sabry (4) of the UNDO Cairo .

The author also thanks the staff of the Bureau of Industrial development Managment. GOFI as stated in annex

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2) UNIDO= United Nations Industrial Development Organization,Vienna, Austria.

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Bureau of Industrial Enviromental Management,
GOFI, EGYPT

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UNITED NATIONS DEVELOPMENT PROGRAMME
ZAMALEK 29, DR. TAHA HUSSEIN STREET, EGYPT.

SUMMARY

This project was supported in part by the UNIDO, Vienna and UNDP, Cairo. The work reported here represent a joint effect on the part of GOFI, Egypt.

In brief, it can be said that the overall efficiency of manufacturing food factory waste water treatment plants depends upon these design, application and operation.

(1) All the industrial waste water from the food factory was passing untreated into the river Nile and the nearest river or steams.

(2) It does not have data of water quality chemical analysis investigation (BOD, COD, SS, oil and grease, etc.) result table industrial waste water of Government enterprise factory and it has no chemical analysis operation and analysis ability of water quality chemical analysis items.

(3) For this project samples were taken from each factory (four companies).

(4) An important and major part of the programme in this area is on-going grant with the city Cairo, river Nile from its southern Egyptian border to the Delta barrages.

A list of completed and on-going projects is presented in the appendix to give the reader an overview of the activity in this area.

INTRODUCTION

There are about 200 governmental industrial Factories in EGYPT along the river Nile & its branches .

In the past, little has been carried out to treat sewerage and industrial waste water effluent .

The existing state of the art had caused water pollution to the river Nile.

This GOFI project consists of four Preserved food Factories with definite plan of measure against pollution at urgently, They are :-

1. EGYPTIAN BOTTLING CO.
   "Pepsi Cola" (Sohag- City)
2. EDFINA PRESERVED FOOD CO. (Alexdandria- City)
3. EL NASR CO. FOR PRESERVED FOOD
   "Kaha" (Kaloubia - Kaha)
4. EL NASR CO. FOR PRESERVED FOOD
   (Giza-Badrashin)

In these industrial activity, the water quality of industrial waste water is generally characterized with "BOD" heigher (bigger) than "COD" But, these four food factories have something in common : BOD is lower (smaller) than "COD"

the result of actual water quality chemical analysis was as follows :

1.	Pepsi cola Co.	BOD 360 ppm COD 771 ppm
2.	EDFINA Co.	BOD 640 ppm COD 820 ppm
3.	Kaha Co.	BOD 385 ppm COD 496 ppm
4.	Badrashin Co.	BOD 2,452 ppm COD 2,728 ppm

The chemical treatment Methods include coaqulation followed by sedimentation must be used .

The biological treatment is achieved by using Controlling Tank (Storage tank) one day capacity size (water volume per day) which is nessesary for feeding Bacteria Hiroagh Friday to Saturday, as the Factory is closed Friday .

The waste water discharge of governmental enterprises EGYPT s is a mix of industrial waste water (from manufacturing Process) and Domestic sewage (As countermeasure it is needed to use cl sterilizing Tank (3-8 ppm injection liquified chlorine gas) of all volume (m3/day) as effluent treated water .. liquified chlorine gases soluble in effluent water chlorine is effective in killing both "Escherichia Coli" and "viruses".

The problem of recycling of effluent treated water not considered because of low price of water.

Industrial waste water and domestic water are separated in the Pepsi Cola Factory Co. only. Pepsi Cola Factory had all machines and process from Germany .

The factory was very fine and maintenance management is according to Germany's modern style .

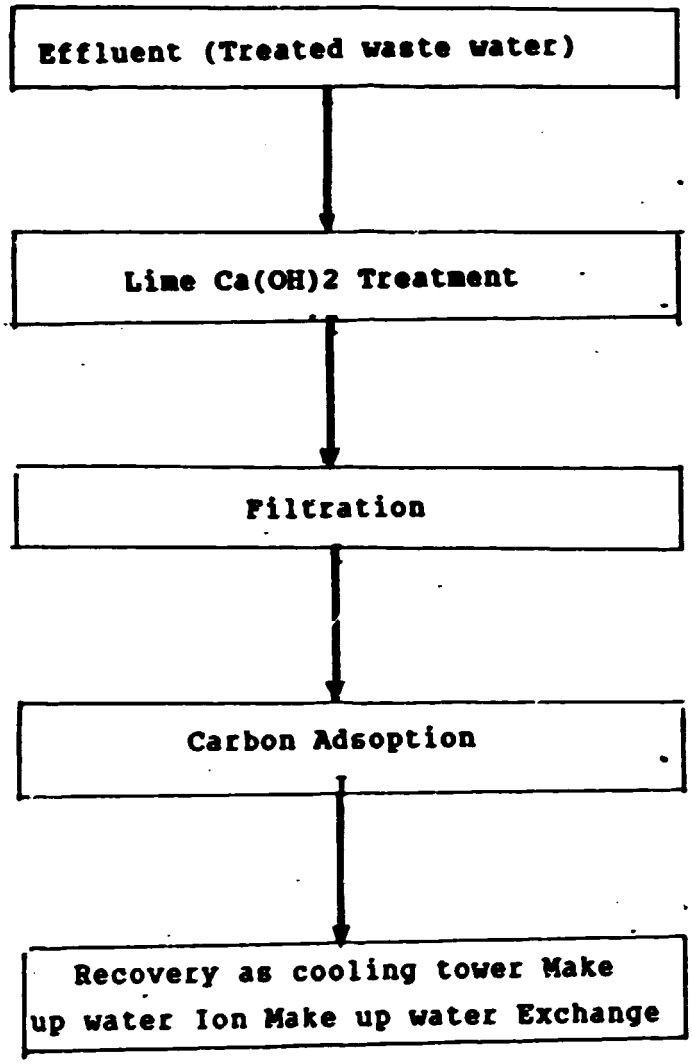
But. Kaha Factory, Badrashin Factory and EDFINA Factory are old factories 30 to 40 years ago/ The pipe lines and pits are joined up for both sewerage and industrial water which is impossible to separate inside Factory .

The problem is a discussion on the alternative processes that have been developed and their general standing in regards to immediate and future application.

Recycling of Effluent treated water:

The recycling of effluent treated water is used for in follow Diagram as a tertiary treatment stage.

..... next page


Effluent (Treated waste water)
Lime Ca(OH)2 Treatment
Filtration
Carbon Adsoption
Recovery as cooling tower Make up water Ion Make up water Exchange

This technology has a high initial cost for the design and operation Activated carbon system. The running cost (in Japan case) is 150 - 200 Y/m3 =(1.87 - 2.5 LE/m3).

At present time the conditions of Cairo-City is very cheap in comparison with other foreign countries, e.g. Cairo-City Tap-water is equal to : m3 0.1 LE/m3 (10Piasters/m3 , 0.05$/m3) In Japan case fresh water price is :25 Y/m3 (0.31 LE/m3) that is about 3 times.

According to this recycling of water was not taken in consideration while making for effluent waste water .

In the future this is a problem to deal with at the Ministry of Industry and at the Ministry of Development, EGYPT.

I like to consider also the possibility of effective utilization of factory waste instead of disposing them through burning in an incinerator .

This will lead to recovery and recycling of waste.

Along a line of thinking about biomass , I propose to direct this reutilization to convert the waste to fertilizer and fodder (animal food).

First, Drainage channel flow in effluent from manufacturing process line at inside Factory. That is small pieces of fresh fruits, fresh Vegetables and fish etc.

These are take out to segregated in side Factory and is given as animal food (cow, sheep, chicken) feeder.

It makes a profit place on the market at a growth period . For example, in Japan was to depreciation at three years proceeds.

The situation of equipment is described in the following page (Photograph No 1,2) . Page 48.

Second, It has been shown in other parts of this report that excess sludge in biological treatment (Activated sludge method).

It was necessary for the sludge disposal problem in that it must either be taken away to a suitable disposal site or applied to sand beds which must eventually be dryed using solar heat . substance used as fertilizer for Agriculture.

PROJECT BACKGROUND

The problem in the food industry lies in the waste it produces it need much water e.g. when producing one ton of tomato Juice (as product), 10 Tons of fresh water is required to sterilize a cleaning water-tank for raw material.

It varies depending upon the season in analysis, deepness and volume of the water required treatment.

Because of the differences on each harvest season on fresh fruits, vegetables and fish etc, the produced items are also not the same during a year, consequently composition and density as well as volume of industrial waste water are fluctuating remarkably.

The detergent and fungicide cause bad effect on efficiency of waste water treatment by biological treatment process.

The pollution loading amount (total BOD:kg-BOD/day) of these four food Factory correspond to the scale of city sewage treated matter for person if converted to population equivalent on city sewage, as follows:-

1.	EGYPTIAN BOTTLING CO. Pepsi Cola	
	Total BOD 864(Kg-BOD/day) equivalent	21.600 persons
2.	EDFINA Co.	
	Total BOD 1.280 Kg-BOD/day	32.000 persons
3.	ELNASR Co. "Kaha"	
	Total BOD 862 Kg-BOD/day	21.500 persons
4.	ELNASR CO. "Badrashin"	
	Total BOD 2.746 Kg-BOD/day	86.600 Persons

NOTE:

The daily water comsumption of one person, sewage, 200 ppm-BOD multiplied by 200L/man.day 40 g -BOD/man.day for example, 864 kg-BOD/day divided by 40g-BOD/man.day=21.600Persons

In a comparison between EGYPT and other countries as :-America, Germany, England and Japan, the investment cost of economical treatment plant is important and, running cost is cheap too. This reason are:-

	(in Egypt case)	(in Japan case)
1- City Tap-water	0.1 LE/m3 =(0.05$/m3)	25Y/m3 = 0.31LE/m3
2- Electric	0.2 LE/KWH=(0.1$/KWH)	20Y/KWH=0.25LE/KWH

3- Personal (labor) expenses per Year/man

1.500-2.000 LE/man/year=

(750-1000$/man.year)

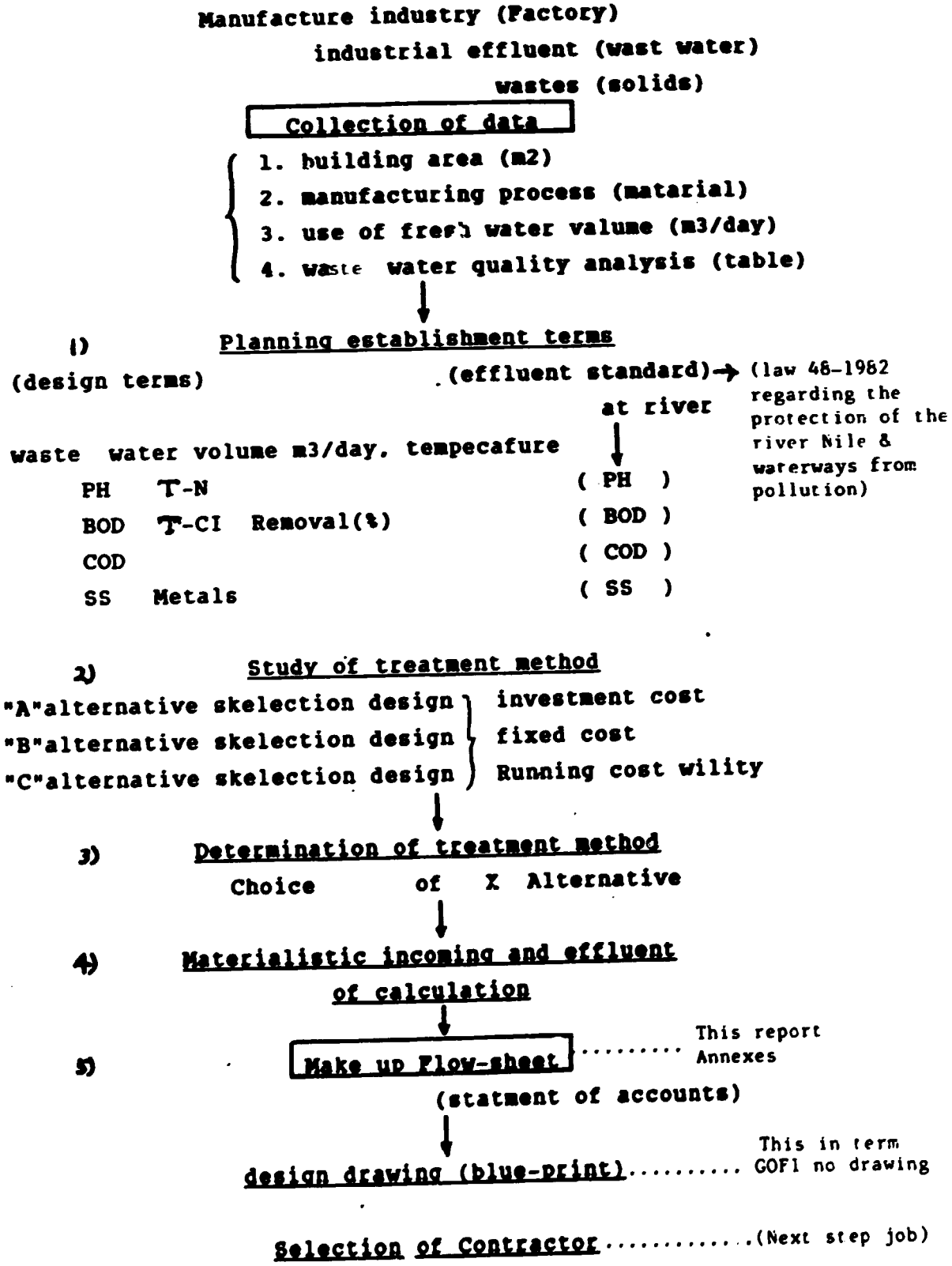
Regarding the volume and concentration of industrial waste water which has to be influent before treatment at last, water quality has been analyzed and taken as reference for designing of an economical treatment plant.

Items of waste water chemical analysis were:

PH (Hydrogen ion concentration) (- log H +) concentration)
BOD (Biochemical Oxygen Demand)
COD (Chemical Oxygen Demand)
SS (Suspended Solids)
T-N (Total Nitrogen)
Oil and grease

I draw up the flow- sheet. The plan course of action is shown in Fig.1. (next page)

Fig.1 A Technique of make up flow-sheet



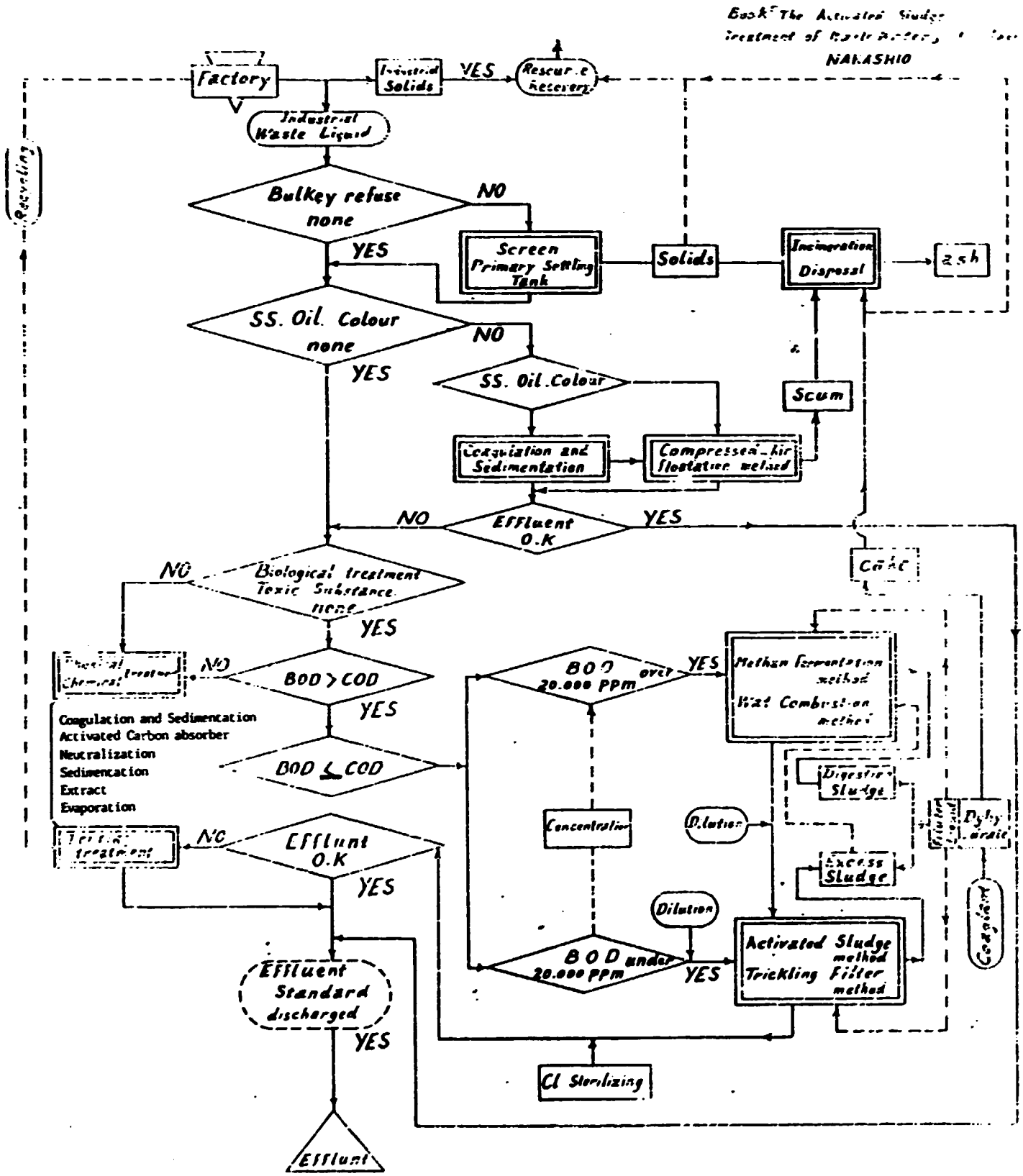
Next, Selection of treatment equipment depends upon the calculation sheet (a statement of accounts) on such as performance of the equipment, size of the Tank and other dimensions, (W), (L), (H), Diameter, pipe laying, motor etc . Fig.2. shows an example of selection of treatment method and a plan (working Drawing) based on designd conditions.

NOTE:

(next page)

Fig.2. "Flow-Diagram of waste water Treatment"
quote from a specialized book
(The Activated sludge Treatment of waste water)
Page 102, 4ed, 1986. NAKASHIO.

Fig.2

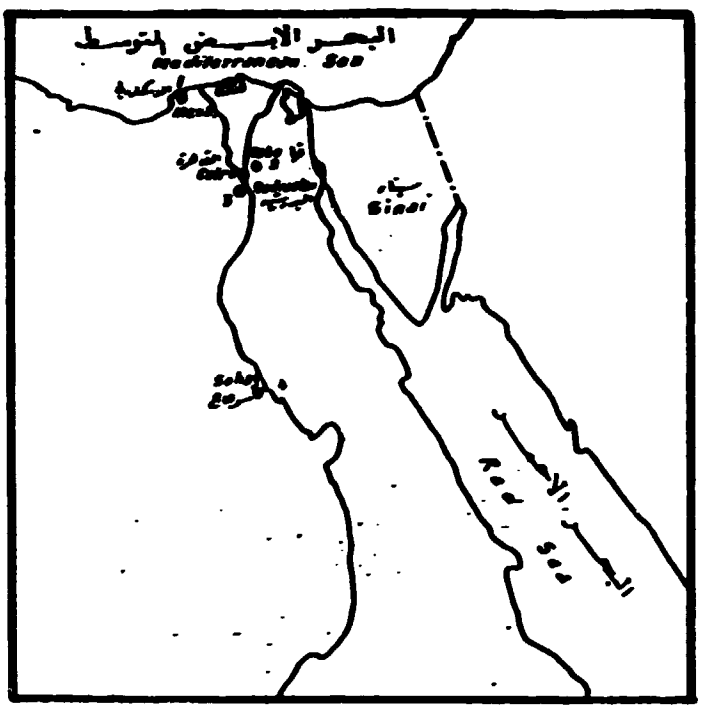

Book "The Activated Sludge
NAKASHIO
Factory
Industrial Solids
YES
Resource Recovery
Industrial Waste Liquid
Recycling
Bulkey refuse none
NO
YES
Screen Primary Setting Tank
Solids
Incineration Disposal
Ash
SS. Oil. Colour none
NO
YES
SS. Oil. Colour
Scum
Coagulation and Sedimentation
Compressed-air flotation method
NO
Effluent O.K
YES
Coke
NO
Biological treatment Toxic Substance none
YES
Chemical treatment
NO
BOD > COD
YES
Coagulation and Sedimentation
Activated Carbon absorber
Neutralization
Sedimentation
Extract
Evaporation
BOD < COD
BOD over 20.000 PPM
YES
Methan fermentation method
Wet Combustion method
Digested Sludge
Concentration
Dilution
Dehydration
Excess Sludge
Coagulant
Dilution
BOD under 20.000 PPM
YES
Activated Sludge method
Trickling Filter method
Tertiary treatment
NO
Effluent O.K
YES
Effluent Standard discharged
YES
Cl Sterilizing
Effluent

RECOMMENDATIONS

General

In view of the many factories presentd in this report and considered by the GOPI, the following recommendations are made :

1. Place of the Factory on the map



1. Edfina Company(Res-El soda - (Alexandria)
2. Kaha company (kalowbia)
3. Kaha company (Badrashin)
4. Egyptian bottling company - pepsicola (sohag)

2. Purpose of the Project

To assist the General Organization for Industrialization (GOPI) in identifying the terms of reference for sub-contracting of detailed engineering and civil design work and monitoring and supervising the contractor's work in installation in waste disposal and water treatment of the food industries.

3. Effluent Standard of irrigation drain. The law and regulations has been made to meet local condition. Law name is as shown below:
(LAW 48-1982, REGARDING THE PROTECTION OF THE RIVER NILE & WATERWAYS FROM POLLUTION)
In application of this law, the Factory are the following

Parameter	Pepsi Cola Co.	EDFINA Co.	in Kaha KAHA CO.	Kaha Co. BADRASHIN
PH	6-9	6-9	6-9	6-9
BOD	30ppm	60ppm	20ppm	20ppm
COD	40ppm	100ppm	30ppm	30ppm
SS	30ppm	60ppm	30ppm	30ppm
Oils & grease	5 ppm	10ppm	5 ppm	5 ppm
Total Coliform (MPN/100ml)	2500/ 100ml	2500 100ml	2500 100ml	2500 100ml

NOTE:

1 All Standards in ppm unless otherwise noted .

Section - 1 PEPSI COLA Factory at Sohag

Site Visit :

1. Place of Factory :
   EGYPTIAN BOTTLING CO. "PEPSI COLA"
   Sohag-Factory - AGhmiem Sohag City

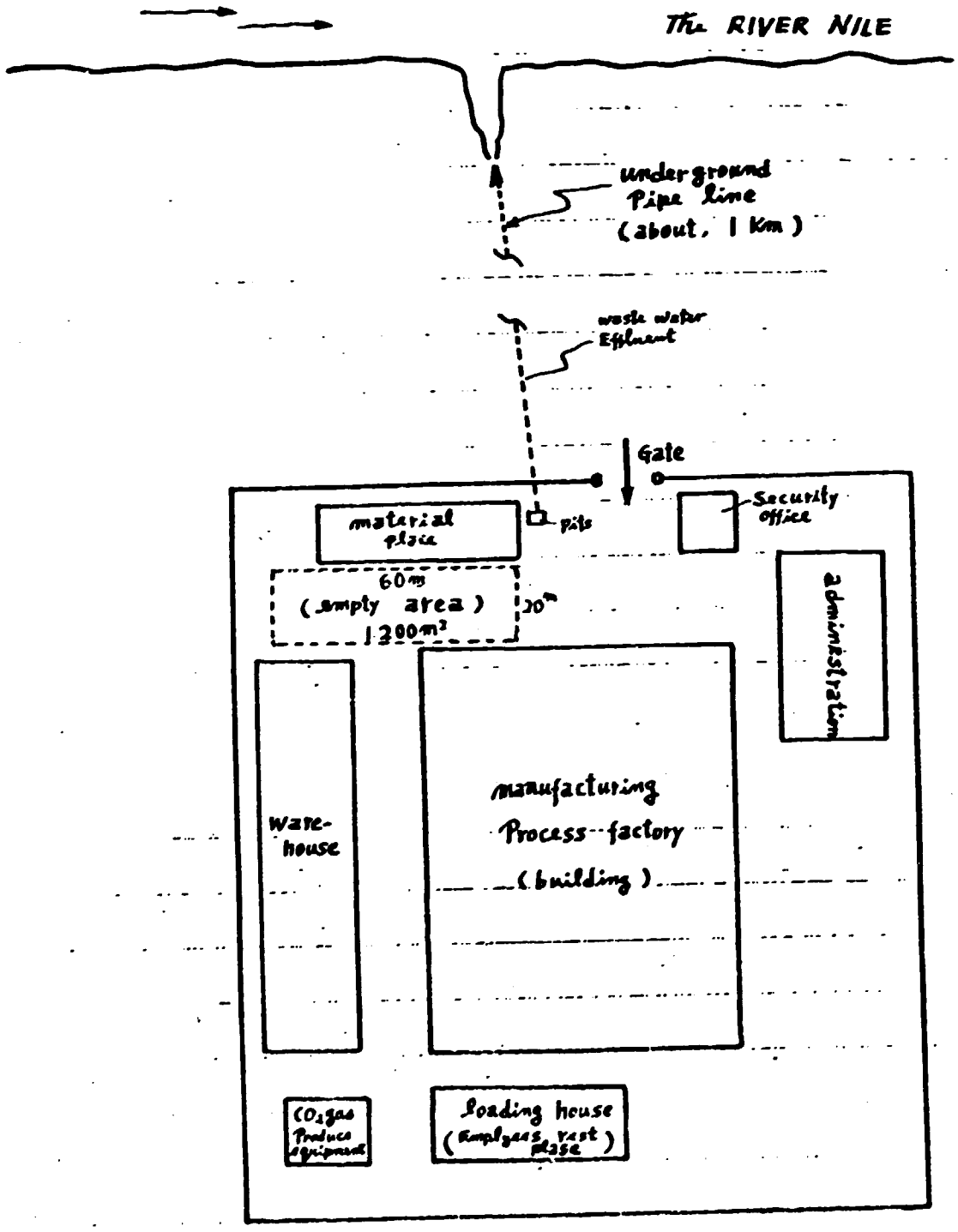
2. The technical meeting hold a two days visits on site on 25,26 November 1986, detail and plans were presented by factory personel .

3. GOFI Visitors
   Engr. Mohamed A. Eweiss
   Egnr. Ali El Sisi
   ----- Makio Nakashio (Japanese)

4. Company Personel
   1) Engr. Mr. Taha abo Eldahab
      (General Managerment Chief)
   2) Factory manager : Engr. Mr. Mohammed Aly Othman
   3) Person in charge: Engr. Mr. Mohammed El Nezamy
      (Quality company manager)
   4) Laboratory chief Engr. Mr. Talal EL Abd

Pepsi Cola Co. (Sohag - City)

A Sketch map of factory



Reduced scale : free

Pepsi Cola Co. (Sohag-City)

A Sketch map of Factory

reduced scale:Free

The RIVER NILE

underground
pipe line
(about. 1 km)

waste water
Effluent

Gate

material place
60m
(empty area) 20m
1.200m2

pits

Security office

ware house

manufacturing process factory (building)

CO2gas produce equipment

loading house (emplyees rest) plase

River Nile

Photo : 1. Effluent of the present Final Point of discharge to the river Nile.

Photo:2. Settling time for the suspended matter on the site

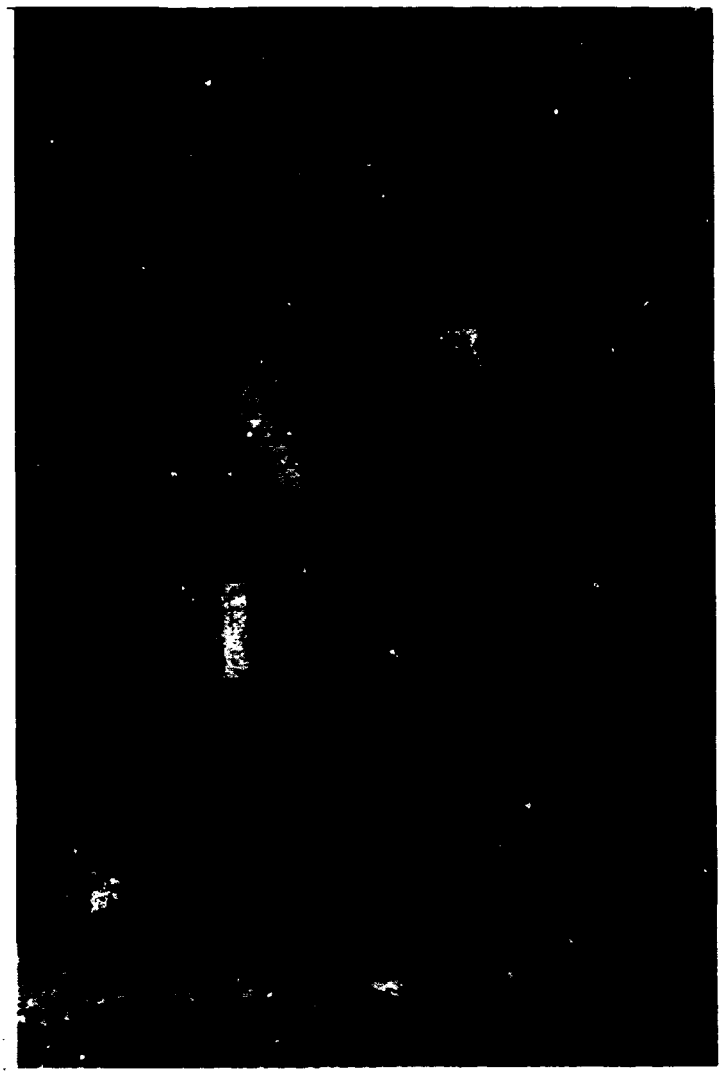


Photo: 3. Settling time for the total suspended solid of waste water and see colour on the site.

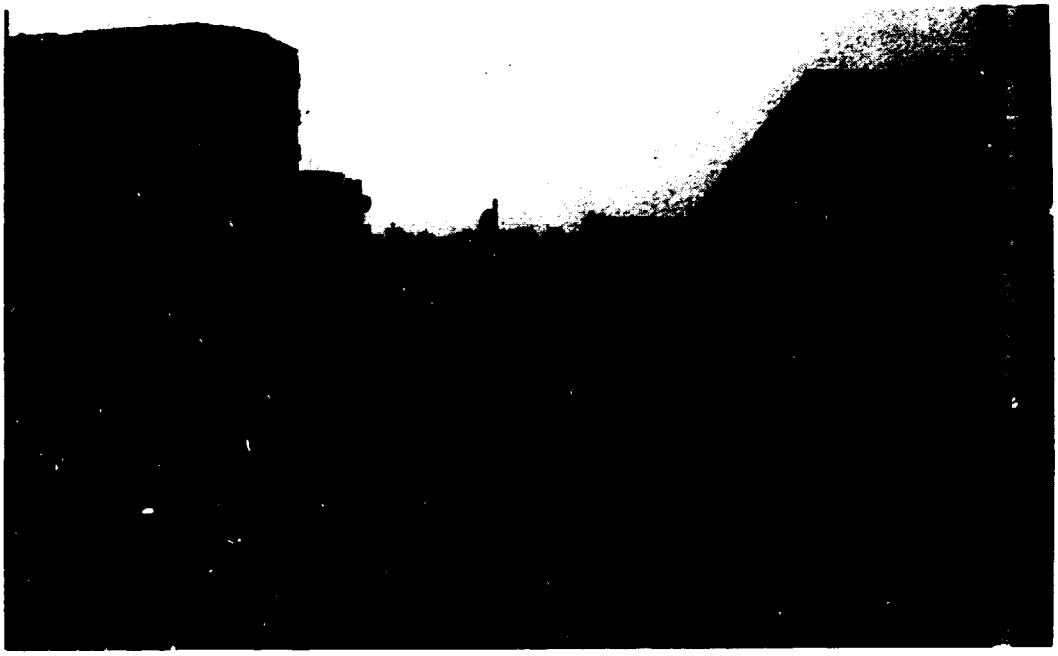


Photo: 4. Upper view of all Pepsi-Cola Factory.

Description of Process (flow-sheet)

1. Planning establish terms

(1) The basis for planning

1) Volume of industrial wast water.

summer season: (6month).24hrs/day.. work operation 100m3/hrs. 24hrs. = 24.000 m3/day

winter season: (6month) 12hrs/day. work operation 100m3/hr x12hrs= 12.000 m3/day

I shall establish treatment unit according to the maximum discharge volume (2.400m3/day)

2) The domestic discharge can be transported away by trucks from the industrial waste water.

3) The number of workers(employees) 150 men

(2) waste water quality of industrial

1)		Effluent Standard	
PH	11.7	PH	6-9
BOD	360 ppm	BOD	30ppm
COD	771 ppm	COD	40ppm
SS	284 ppm	SS	30ppm
Oil & grease	0	Oil & grease	5

2) A unit cost of City tap-water 0.03 LE/m3 (3piasters/m3)

3) The empty area, about 1.200m2 (20mx60m)

NOTE: (LE, is a abreviation of EGYPT POUND .

2. Plant Description (Major Equipment specification)
The flow-sheet diagram of the economical treatment plant is shown in figure 1. (Annex)

2-1. Controlling Tank

Controlling tank have following object

1) It will give us uniform concentration of the iflulnt waste water.
2) We shall get rid of the volatile matter, this will cause the decrease of the BOD 10-15% by aeration agitation condition .
3) It will act as storage tank as the factory is closed on Friday which is necessarly for feeding bacteria (for Biological tratment : Activated Sludge method).
4) Also for adjustment of the pH value of the waste water(which is 11.7)to base condition for Activated sludge method,(which is 7) by using 20% NaOH solution.

Specification of Controlling Tank

Components / Item	Type Material	Dimension(m) (W) (L) (H)	Capacity (m3)	Space requirement(m2)
Controlling tank body	Aeration-Agitation concrete	20x36x5	1800	720

Retention time : 18 Hr

* Attatchments

1. Air diffuser : Air distribution pipe : 2 1/2 inch
Sparger
Blower (Air-compressor)

- 2. 20% H2 SO4 Storage Tank
Capacity 20m3 (in side Tank Rubber Coating) one set.
.Dimention 2.7m x 3.5 (H)
material steel sheet
space requirement 6m3

3. Instrumentation
Type (PnuC) jutamatic control system, one set (PH indicate control)

2-2 Coagulation and Sedimentation Tank

Components / Item	Type Material	Dimension(m) (W) (L) (H)	Capacity (m3)	Space requirement(m2)
Coagulation tank	Concrete	2.5x10x2	50	25
Sedimentation tank	concrete	2.5x13x3	100	33

* Attachments

1. Agitation : 1) quick agitation, 120 r.p.m.(1.5 m/sec. speeed)
MOTOR: reduce speed of a machine, 3HP retention time : 5 minutes
2) Slow agitation, 30 r.p.m.(30 m/sec. speeed)
MOTOR: reduce speed of a machine, 5HP retention time :25 minutes

2. FeSO4 steroge Tank (coagulant)
   Capacity 10m3
   Dimension 2.1 m x305m (H)
   material Steel sheet
   space requirement 5m2

3. PAC (Polymer coagulant aids) - - - concentration of use 5-10 ppm
   Capacity one m3 one set
   Dimension one m xone m(H)
   material steel sheet
   space requirement one m2

2-3 Neutralization Tank
Neutralization tank is the PH adjustment for Activated Sludge process of next step using 10% H2SO4

components / Item	Type Material	Dimension(m) daiameter(H)	Capacity (m3)	Space requirement(m2)
Neutralization tank	Concrete	D=5m x2.5	50	25

Retention time : 30 min

* Attachments

1. 10% H2SD4 Strage Tank
   Capacity 20m3 (in side tank rubber coating)
   Dimension D = 5m x 2.5m (H)
   Material Steel Sheet
   Space requirements 25m2

2. Agitation : 50-80 r.p.m Agitator one set
MOTOR : reduce speed of a machine

2-4 Aeration Tank

Incoming raw concentration waste water is fed to Aeration Tank where it is treated biologically by microorganisms.

components / Item	Type Material	Dimension(m) (W) (L) (H)	Capacity (m3)	Space requirement(m2)
Aeration tank	Aeration-Agitation concrete	* 16x23.5x4	1500 * 8mx2 =	376 16m

1. Bod looding : 0.7 kg-BOD/m3.day
2. incoming waste water quality : BOD 240 ppm
3. Total-BOD 0.24kg-BOD/m3x2.400m3/day=576kg-BOD/day

$$\frac{576\text{kg-BOD/day}}{V} = 0.7\ \text{kg-BOD/m3day}$$

V = 822m3

4. Return sludge rate as 30%

2400m3/day x 0.3 = 720m3 (30m3/hrs)

822m3 + 720m3 = 1500 m3 - - - Aeration Tank

5. Retention time :(1500m3 -:- 100m3/hrs) = 15 hrs

* Attachments

1. Air diffuser : Air distribution pipe 2.5 inch sparger

2. Blower: Volume of the compressed air.

1) Controlling tank 22m3/min

2) Aeration Tank 24m3/min

1)+2) 21m3/min+24 m3/min=45m3/min

(Volume) : 45m3/minx1.4 (Efficiency)= 63m3/min

Type: Turbo-type Blower

one side in , 5 step, moter-direct

suction presure,- 200mm/ag

revolution per minutes, 2000-3000 r.p.m

Motor,: 100kw (3.000volt)

3. Instrumentation

Type PH1- automatic contral system, one set

(PH indicate)

2-5 Settling Tank

components / Item	Type Material	Dimension(m) (Daimeter)(H)	Capacity (m3)	Space requirement(m2)
Settling tank	Sludge collector concrete	D=16m x 2	400	256

Retention time : 4 hrs(100m3/hrs)

* Attachments

1. Sludge collector : scraper - type
2. reduction gear included machine-Motor

reduce speed, 1 revolution per 30 minutes

3. Return Sludge Pump

(30m3/hrs) 0.5 m3/min caliber (Diameter)
(4inch)=100mm 3.7kw x 2set,3.7KW x 2set Head15m

2-6 Sludge Tank (Precipitator)

* The accounts of Excess sludge Volume

BOD, removal rate 93% 284 ppm 20ppm/BOD

2400x284x(1-0.3)x0.93x10 = 0.443ton/day-dry matter

*Return sludge concentration valume :

$$\frac{0.443 \times 10^6}{7500} = 59 m3/day \text{ wet}$$

According to need sludge tank capacity 60m3

1) (W) (L) (H) material: concrete
4 x 5 x 3m
2) Space requirment 20m2
3) Retention time : One day (Settling)

2-7 Sludge diposal

Sludge tranfer pump 1 set

truck away to drying solar heat bed .....next page photo 5

(W) (L) (H)

- Sand bed Size 6m x12mx0.5-0.7m, 10set
(sand)

Spacee requirement 72m2x10set = 720m2

- weight ton of sludge produced annually

0.44ton/day.dry x 360day/year=158.4ton/year
(used as fertilizer.)

2-8 Holding Tank (Effluent treated water)

2,400m3/day, 1.66m3/min, retention time: 15minutes

Capacity	25m3		
	(W)	(L)	(H)
Dimension	3	x 4	x2m
material	concrete		
space requirement	12m2		

Photo : 5.

For example, drying solar heat bed in the Philippines

Arrangement of Building area

No	Item	Site	Space	requirement (m2)
1.	Controlling	Tank		720
2.	Coagulation and sedimention	Tank	25 33	58
3.	Neutralization	Tank		
4.	Aeration	Tank	376	632
5.	Settling	Tank	256	
6.	Sludge	Tank		30
7.	Holding steel sheet etc,	Tank		12
8.	(total)	Tank		18

Total 1.470m2

Way + 130

Building area- - - - 1.600m2

Initial cost (construction cost)

	Economical plant Item	Capacity	LE
1.	Concrete Tank	3.985m3	427.750
2.	Steel sheet etc Tnak	51m3	55.000
3.	Instrumentation contented wiring work	(PHIC 1set) (PHI 1set)	72.500
4.	Pipe laying	(4inch SGP153m) (3inch PVC 50m) (2.5inch PVC 180m)	50.000
5.	Pump and Motor	24 KW	11.500
6.	Motor & reduce speed a mashine	38HP	30.700
7.	Blower	1set	175.555

It Sums up to - - - - 1.022.450 LE

NOTE: 1 U.S.$=1.35 LE Total - - - - U.S.$ 757.370

Running Cost

Item / component	consumption A Unit price	weigh or volume (day)	day per operating expenses LE/day	annual operating expenses LE/year. 360 day
1. Power (Electric)	0.2LE/KWH	1312KWH	263LE	95.000LE
2. Chemical				
H2SO4	300LE/ton	0.5ton	150	24.000
FeSO4	262LE/ton	0.24ton	63	22.680
PAC(polymer)	19LE/KG	12kg	228	82.080
3. Labor	2000LE/year	5men	30	10.000
	Total - - - -		734 LE/day	263.760 LE/Year

NOTE: no use utility (fresh water, gas. steam)

*Average daily amount of wast water treated valume 2.400 m3/day

(1) One day per running cost 734 LE/day

(2) Year per running cost 263.760 LE/year
(Treated waste water)

(3) BOD kg per operating expenses 0.85 LE/BOD kg

(4) Waste water m3 per operating expenses 0.3 LE/m3

Investiment Cost (Total)

1. Building area	way + 130m2 - - - 1.600 m2	
2. Construction Cost	1.022.450 LE (US$ 757.370)	
3. Running Cost		
One day per running cost	734LE/day.	$543/day
Year per running cost	263.760LE/day	$195.377/day
BOD Kg per operating expenses	0.85LE/BOD-kg	$0.62/Kg-BOD
Waste water m3 per operating expenses	0.3LE/m3	$ 0.22/m2

NOTE: 1 U.S.$ = 1.35 LE

Section - 2. EDFINA CO.

Site Visit

1. Place of Factory :
   EDFINA CO ALEXANDRIA . EGYPT
   City Alexandria

2. Day of site visit
   10, 11 December 1986
   to City Alexandria . EGYPT

3. GOFI visitors
   Engr. Mohamed A. Eweiss
   Engr. Ali EL Sisi
   ---- Makio Nakashio (Japanese)

4. Company Personel
   1) Factory manager : Engr. Mr. ADEL E. ELSAMAHY

   2) Head technicl Sector: Mr. Khald Hassen gouda

   3) Person in charge :Engr. Mr. Kamal Azmy

Description of Process (flow-sheet)

1. Planning establish terms

(1) The basis for planning

1) volume of industrial waste water
V = 2.000 m3/day (83.3 m3/hrs)

2) work operation 24hr (continous operation)
Friday is a holiday

3) on a three-shift- a - day basis (one shift 1.100 workers) a day , 3.300 wokers

(2) Analysis of water quality of industrial waste water

1)

			Effluent Standard	
PH	5.5 -6		PH	6-9
BOD	640	ppm	BOD	60ppm
COD	820	ppm	COD	100ppm
SS	200-500	ppm	SS	60ppm
Oil & grease	800-1.000		Oil&grease	10ppm

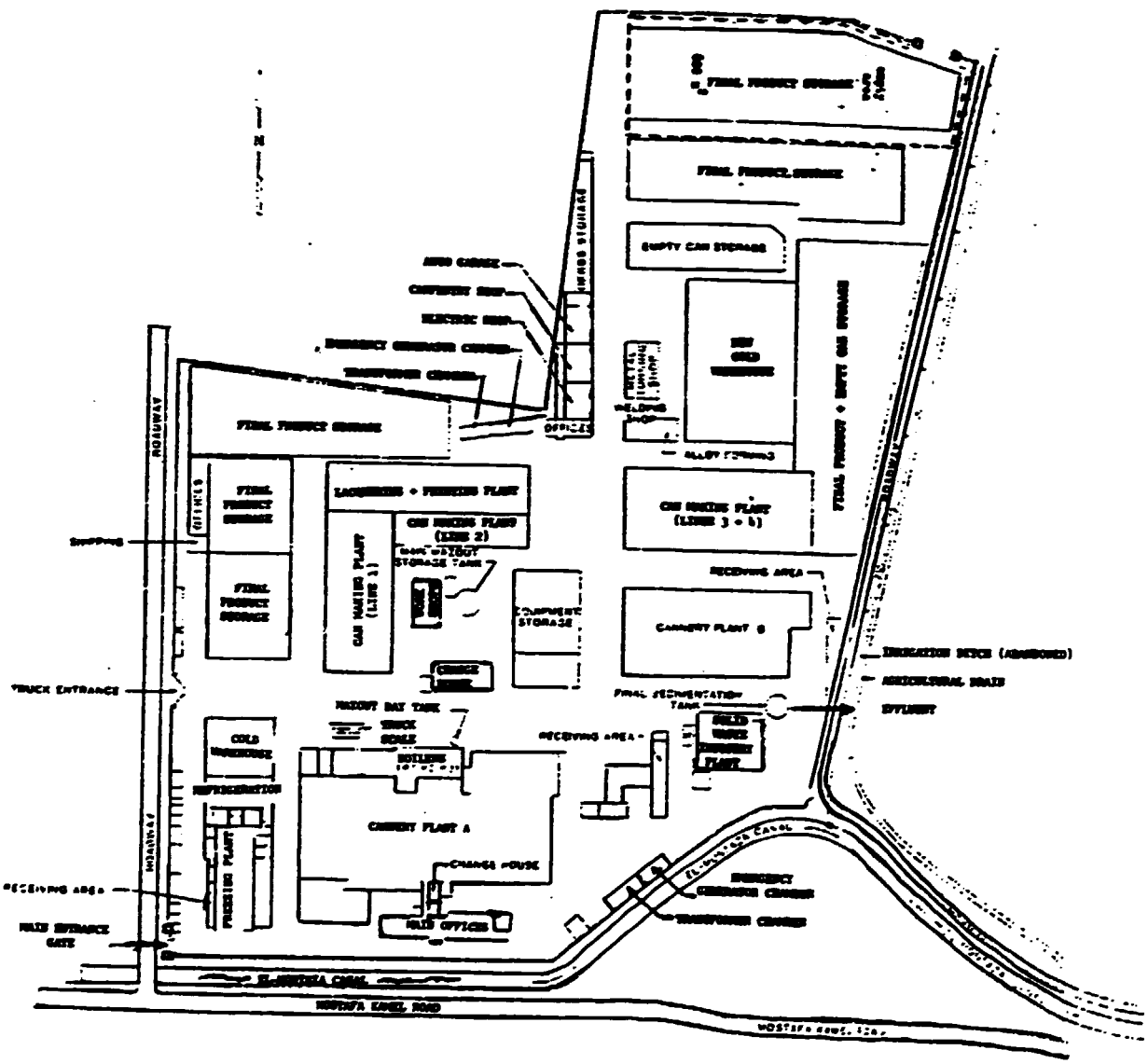
2)A unit cost of city tap-water,0.1LE/m3(10Piasters/m3)
" Electric 0.026LE/KWH(106Piasters/m3)
" NaoH 300 LE/Ton

3) Personnel (Labor) expenses per year 2000LE/year

4) The empty area, about 800 m2

EDFINA FACTORY

The map of Factory



EDFINA COMPANY
FOR PRESERVED FOODS

Reduced Scale 1/800

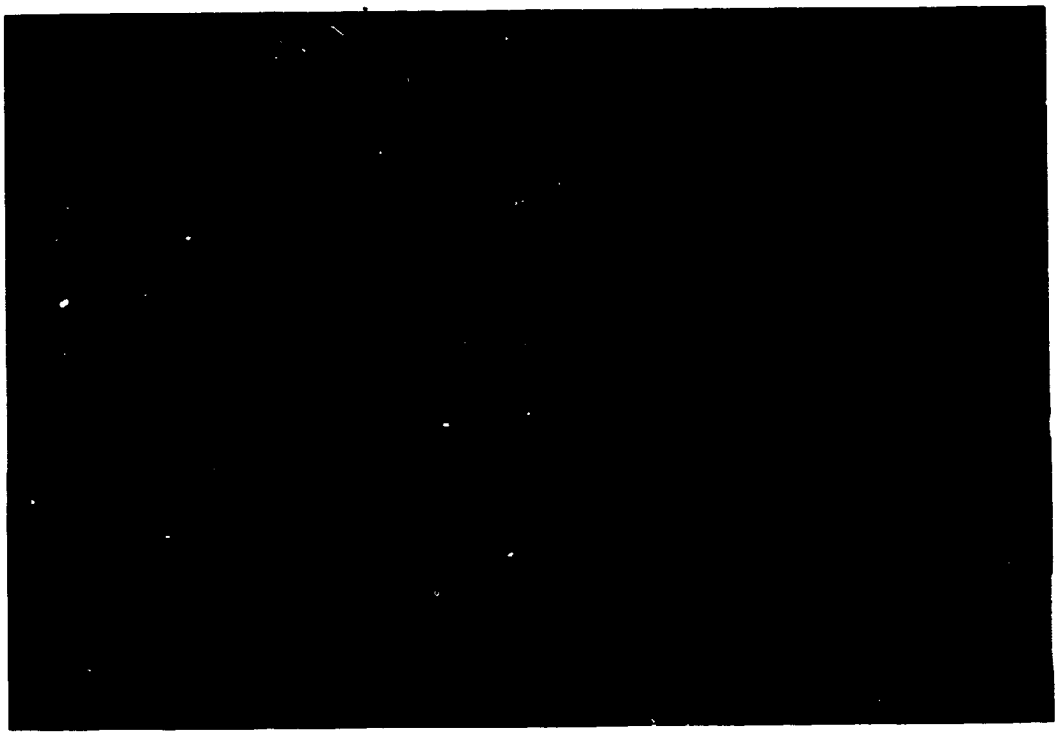


Photo : 1. Gate out side view of Edfina Company from the Eastern corner of the site

Photo: 2. Settling time of suspended solid - colour observation of waste water.

Photo:3. The end discharge point of waste water for the whole factory

Photo : 4. Another view for the finl discharge point with a cylinder containing a portion of the effluent.

2. Plant Description

Edfina Company Flow-sheet:

In the supposed project we find the following observations.

(1) Sedimentation needs a very big area which is not the case in the plant.

(2) Neutralization is carried out in separate tank which can be done in the same controlling tank .
This flow-sheet is not right for the following reason.

(3) This company produce food material and this is treated usualy biologically.

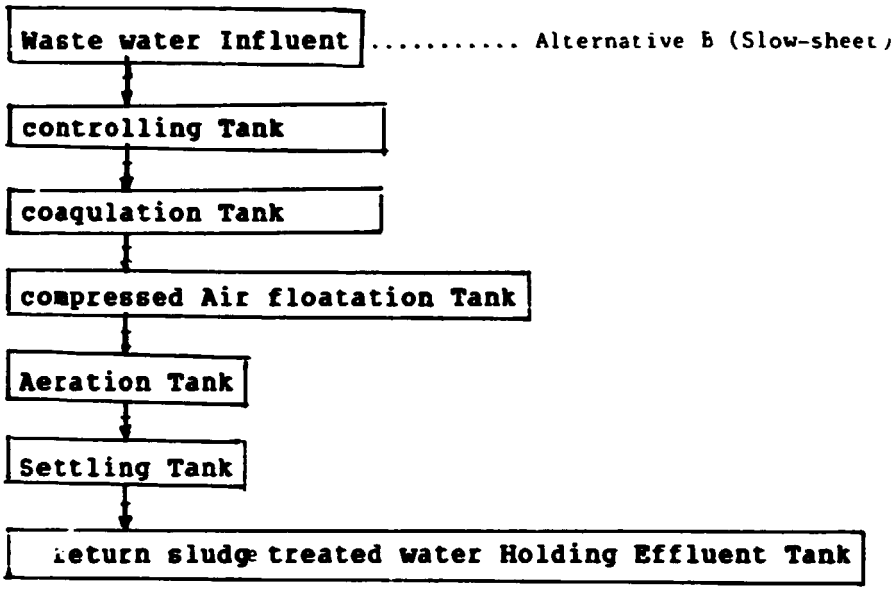
(4) The retention time is 24 Hr in the Sedimentation Tank and this case decomposition which leads to the elevation in BOD and COD.

(5) The temperature in EGYPT is 25-35 C° average and this is too high leading to decomposition.

(6) Inside the sedimentation Tank, sludge will be collected which needs the use of a sludge collector.

This supposed project is appreciated by Engr. Mr. Eweiss (General Manager . Constructor, GOPI).

I will try only to carry out materialistic incoming and effluent of calculation of the treatment process by using controlling Tanks as shown in the following sheet.


Waste water Influent
..... Alternative B (Slow-sheet)
controlling Tank
coaqulation Tank
compressed Air floatation Tank
Aeration Tank
Settling Tank
return sludge treated water Holding Effluent Tank

The flow-sheet diagram of the industrial treatment plant is shown in Fig 2:

Major Equipment Specification

Compone-ntes / Item		Material	Dimension (m) (W) (L) (H)	Capacity (m3)	space require-ment (m2)	Remarks (Attach-ments)
1.	contralling Tank	concrete	10X 36x 5	1800	360	10%NaoH Strage tank PHIC Aeration Agitation
2.	Coagulation Tank	concrete	2x 10 x 2	40	20	Al2(50)3Strage tnak PAC strage tank motor 2 set
3.	Compressed -Air Floatation	Steel sheet	1.5x 9 x 2	27	25	Sludge collector compressed-Air water pressure pump Air Tank, valve
4.	Aeration Tank	concret	16x26.5x4 (8x2)	1700	425	Aeration Agitation (PHI) Blower
5.	Settling Tank	concret	15m x2	350	225	Sludge collector Retun sludge pump
6.	Holding Tank (Domestic treatment)	concret	2x 5 x 2	20	10	
7.	Digester Chamber	concret	600 people Tnak	300	100	I. sterilizing Tank
				concret 4210m3	1.165m2	

Initial Cost (Construction Cost)

Item \ Economical plant	Capacity	LE/cost
1. concrete Tanak	3910m3	500.000
2. Steel sheet etc Tank sludge collector	51 m3	27.000
3. Instrumentation	(PHIC)(PHI)	175.000
4. Comperssed-Air floatation		443.000
5. Blower		75.000
6. Pump and Moter	73.4KW	11.500
7. Moter and reduce speed a machine	33 HP	22.500
8. Blower (Ain-Compresser)		75.000
9. digester chamber	300m3	75.000
		1.376.000 LE

Running Cost

Item \ component	consumption A Unit price	weigh or valume	day per operating expenses LE/day	annual operating expenses LE/year. 360 day
1. Power (Electric)	0.016LE/ KWH	1450KWH/ day	25 LE	9.000
2. Chemical				
NaoH	300LE/ton	2ton	60	21.600
PAC	19LE/KG	18.7kg	355	127.800
3. Labor	2000LE/year	5men	30	10.000
4. digestor				
- Chember Electric	0.016LE/KW	45KWH	6	2.160
I liguid	1.25LE/Kg			
			476 LE/day	170.560 LE/Year

* Average daily amount of waste water treated valume

V=2.000 m3/day

(1) one day running cost 476LE/day

(2) Year running cost 170.560LE/year

(3) BOD Kg per operating expenses 0.38LE/Kg-BOD

(4) waste water m3 per operating expenses 0.27LE/m3

Investement Cost (Total)

1.	Building area	way+119m2--1.300m2
2.	Construction cost	1.376.000LE
3.	Running Cost	
	one day per running cost	476 LE/day
	Year per running cost	170.560 LE/year
	BOD Kg operating expeness	0.38LE/Kg-BOD
	Waste water m3 per expenses	0.27LE/m3

Section-3. In Kaha "Kaha" Co.

Site visit

1. Place of Factory:
   AL NASR CO. FOR PRESERVED FOOD "Kaha"

2. Site visit of day:
   1st: 6 November 1986
   2nd: 17November 1986

3. GOFI visitors:
   Engr. Ali El Sisi
   Engr. Hoda William
   Engr. Eglal Moustafa
   ____ Makio Nakashio (Japanese)

4. Company Person:
   1)Factory Manager : Engr. Mr. Hussam Zaher
   2) Person in charge : Engr. Mr. Yousry Moustafa

Description of Process (flow-sheet)

1. Planning establish terms

(1) The basis for planning

1) volume of industrial waste water
V = 2240 m3/day (140 m3/Hr)

2) work operation 16hrs
Friday is a holiday

3) on a two-shift- a - day basis

(2) Water quality of industrial waste water

1)

			Effluent Standard	
PH	6.1		PH	6-9
BOD	385	ppm	BOD	20ppm
COD	496	ppm	COD	30ppm
SS	130	ppm	SS	30ppm
Oil & grease	180ppm		Oil	5ppm

2)A unit cost of city tap-water 0.1LE/m3
" Electric 0.2 LE/KWH

3) Personnel (Labor) expenses per year 2000LE/year

4) The empty area, about 2800 m2

Kaha Factory (Kaloubia)

A Sketch map of Factory

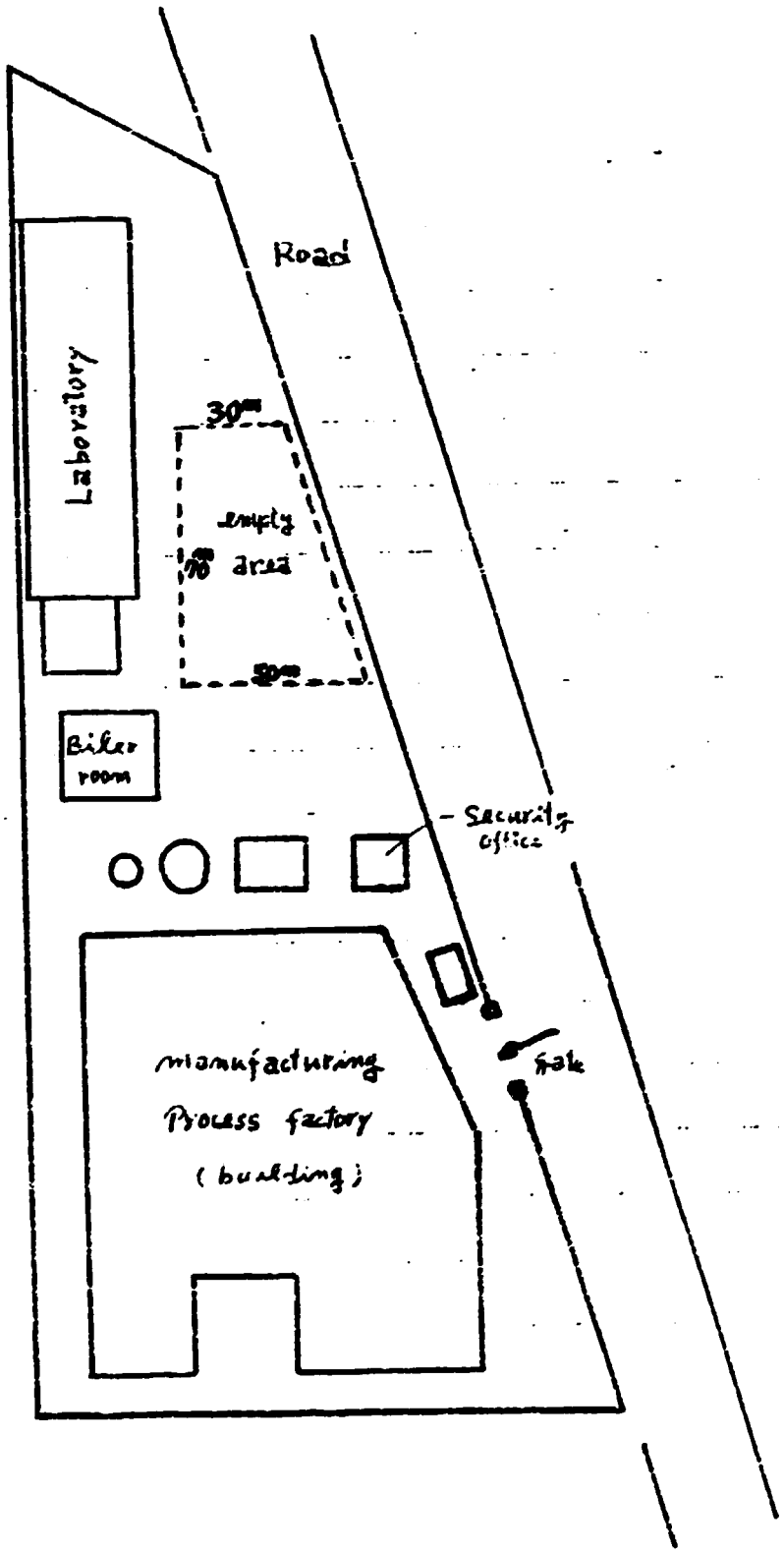


Photo: 1. Outside view of Kaha Company at Kaloubia

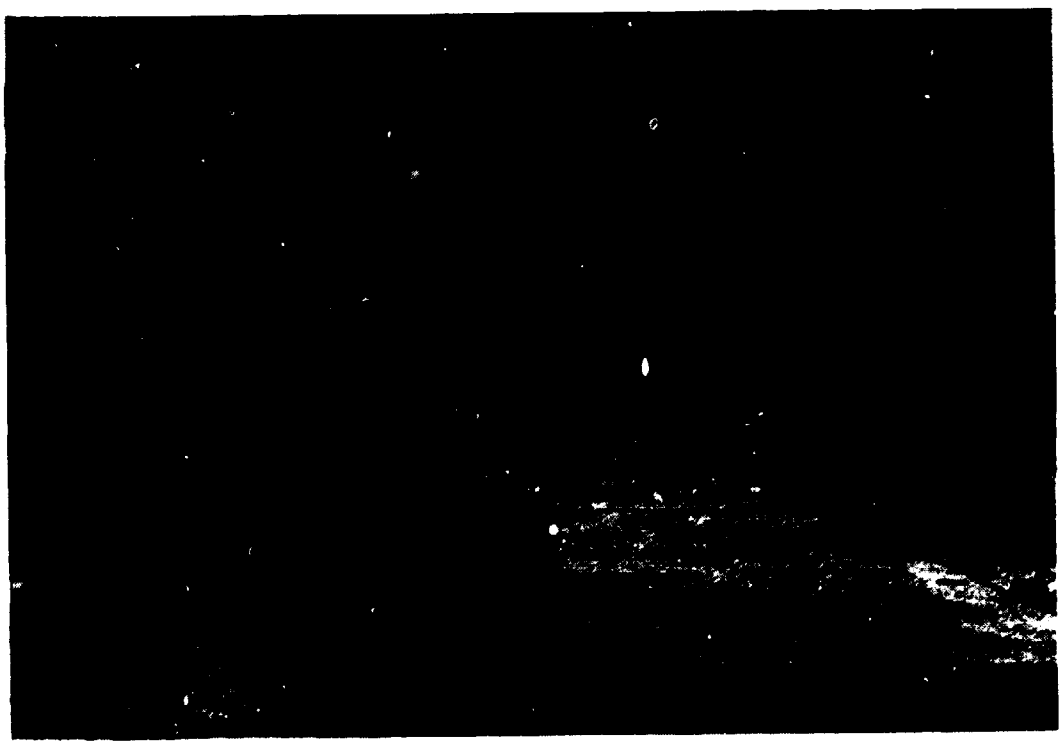


Photo: 2. Inside view of Kaha Company at Kaloubia

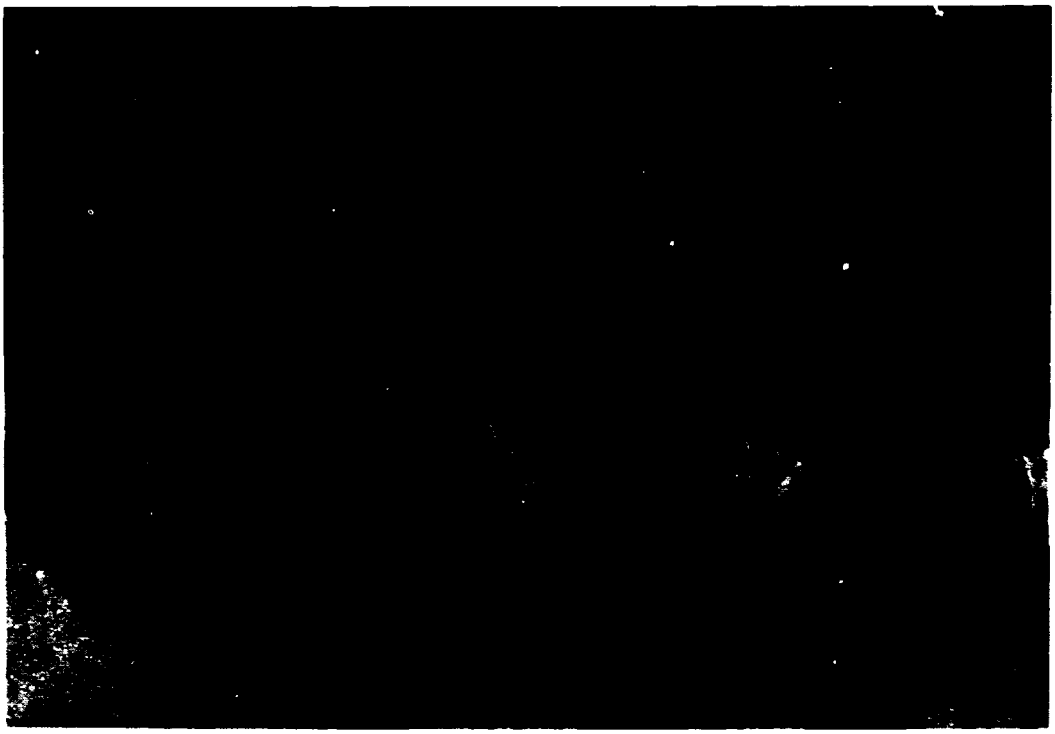


Photo:3. Four samples taken from four discharging points for industrial waste water - to make a compariason in color between each other

Photo: 4. The above four samples after putting in Beakers at the company lab to make the color comparaison test.

Photo:5. Collecting tank for industrial waste water

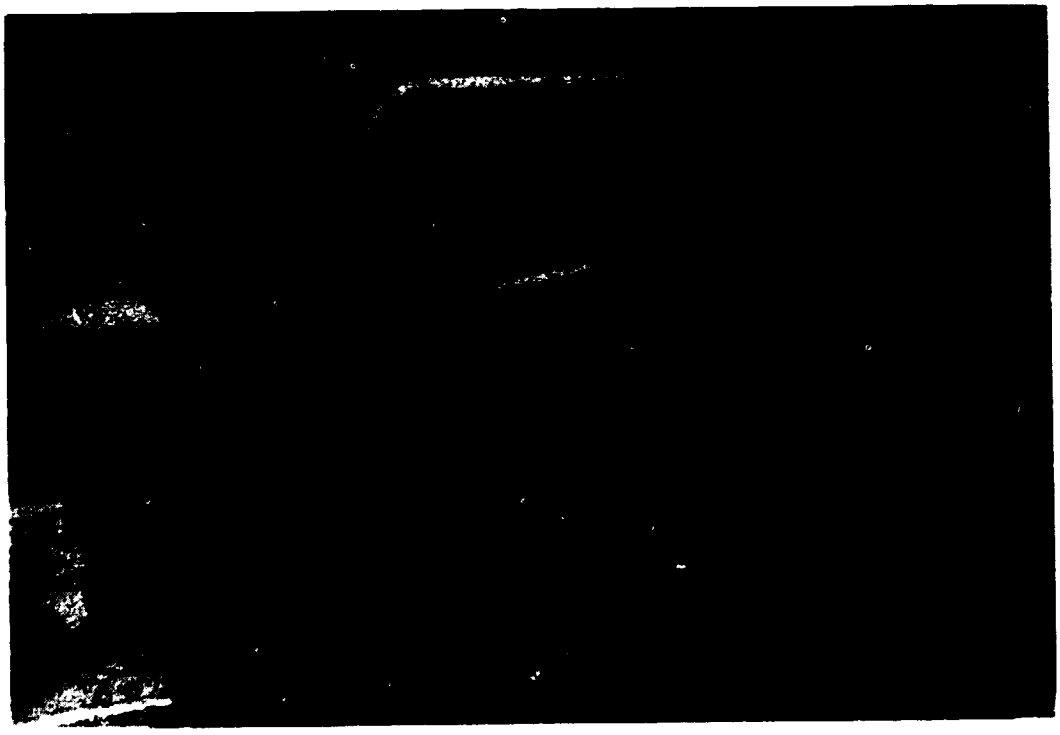


Photo: 6. Existing waste water transfer pump .

2. Plant Description (Major Equipment Specification)

The flow-sheet diagram and the material inlet and effluent of calculation is shown in Fig. 3.

2-1 Bulky refuse recovery equipment (in side the Factory)
First, the solids (small pieces, cubes, grate, pare etc) is removed after the Jam and Juice manufacturing process.
Second, There are bulky refuse (fruits, vegetable, fish,etc) is used for animal food,(cows sheep and chicken) making a good profit .

In case that the scale is 500m3/day waste water or more, the brief specification for this equipment are as shown in photo 1,2. (see photogograph)

expect removal rate

SS 180 ---72%--- 50ppm

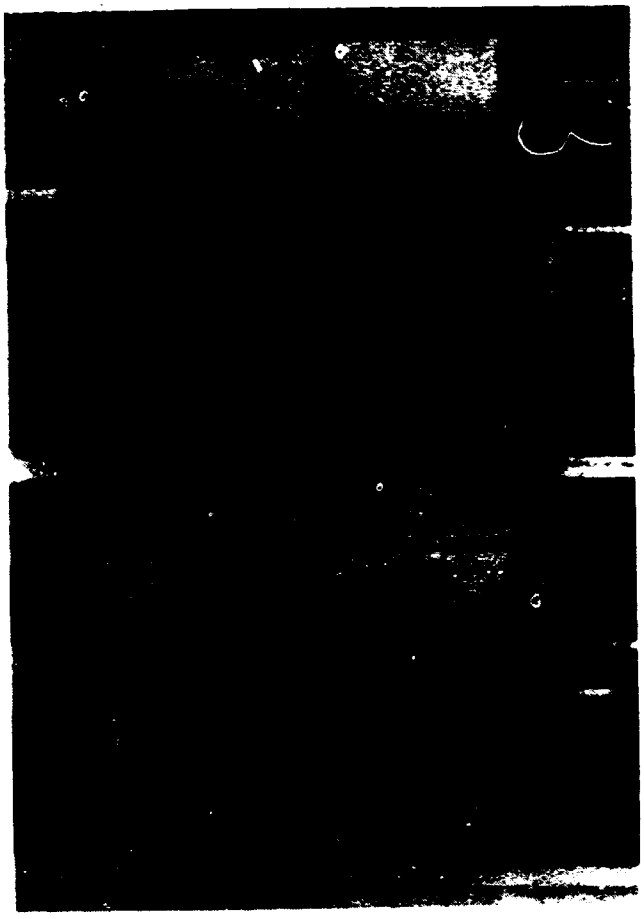


Photo: 1. Bulky refuse recovery equipment

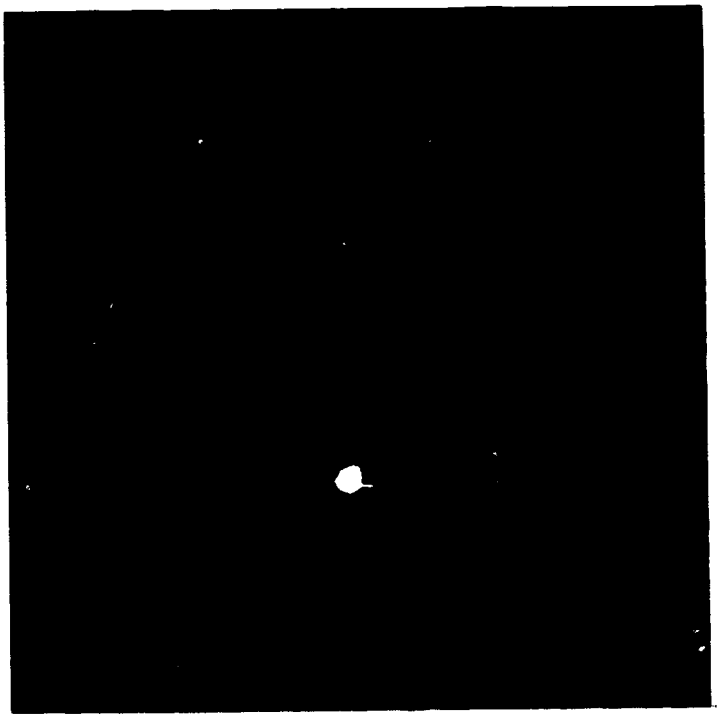


Photo: 2. Bulky refuse recovery equipment

2-2 Compressed-Air Flotation Tank

The object of this equipment is the removal of oil and grease from waste water. This Factory is in the effluent standard of irrigation drain 5ppm It is severe standard for needed this Flotation separation Tank .

1) The effleunt waste water oil and grease 180ppm, SS 130ppm
2) Waste water volume 2240m3/day 140m3/hrs. 16Hr work operation
3) Presupposition terms of compressed-Air Flotation method

(1) A/s Air per solids rate: 0.03 Kg-Air/Kg-Oil/SS
(2) Water surface loading : 90-220m3/m2.day
(3) Solids loading: 100-150Kg/m2.day

(calculation)

effluent waste water solid (oil and SS) volume

0.18Kg/m3 x 2.240m3/day = 403.2Kg/day

Required Air 0.03Kg/Air/Kg-Oil.SS x 4D3 Kg/day=12Kg-Air/day

Solubility of Air is by Henry's Saw pressure water 5Kg/cm2

20 deg 1Kg/cm2 -- 0.024 Kg-Air/ m3 water)Air-
20 deg 5Kg/cm2 -- 0.02 Kg-Air/ m3 water)Solubility

Air Tank (Saturated Air Solution) of forming Air rate as, 70% Producted forming Valume:

(0.12 - 0.024) x 0.7 = 0.067Kg-Air/m3. water

Requrired pressure water valume = $\frac{12}{0.067}$ = 178.57=180m3-water/day

Air Saturated recycle rate : $\frac{180}{2.240}$ = 0.08 = as. 1

Solids Loading 100Kg/m2day (adaptation of planning)

Separate space : $\frac{430Kg}{100Kg}$ = 4.03m2 = as. 6m2(a)

Components / Item	Type Material	Dimension(m) (W) (L) (H)	Capacity (m3)	operating pressure	Space requirement (m3)
Compressed-Air Floatation Tank	Scum collector steel sheet	1 x 6x2.5m	15	5Kg/cm2	6

Retention time : $\frac{15m3}{(2240+2240-1)/1440min}$ = 4.83min=5minutes

* Attachments

1. Scum collecter	one set		
2. Compressed-Air machine	"		
3. Compressed-Air Pump	"	Space requirement CM2 6m2 (b)	
4. Air Saturated Water Tank	"		
5. Back pressure valve	"		
6. Incinerator of Scum	"		
Total (a) + (b)	Total	= 12m2	

expect remoral rate

Oil and grease	180ppm	94%	10 ppm
SS	50ppm	40%	30 ppm
BOD	385ppm	10%	347ppm
COD	496ppm	15%	421ppm

Components / Item	Type Material	Dimension(m) (W) (L) (H)	Capacity (m3)	Space requirement(m2)
Controlling Tank	Aeration-Agitation concrete	20x22x5m	2200	440

Retention time : 23.6 Hr

*Attachments

1. Air diffuser: air distribution pipe 3 inch
   sparger 75 mm
   Blower (Air-compressor)

2. 10% NaoH Storage Tank 1 set
   Capacity 20m3 (in side tank resin trated coating)
   Dimension(D=2.7m x(H= 3.5m)
   Material : steel sheet
   space requirement 8m2

3. Instrumentation
   Type (PHIC) automatic contral system one set
   (PH indicate contral)

2-4 Aeration Tank

Components / Item	Type Material	Dimension(m) (W) (L) (H)	Capacity (m3)	Space refuirement(m2)
Aeration Tank	Aeration-Agitation concrete	16 x28 x 4	1800	450

1) BOD loading 0.6 Kg-BOD/m3. day

2) incoming waste water quality : BOD 300ppm

3) Total BOD 0.3Kg-BOD/m3 x2.240m3/day = 672Kg-BOD/day

$\frac{672Kg\text{-}BOD/day}{V} = 0.6\ Kg\text{-}BOD/m3.day$

V= 1120 m3

4) Return sludge rate as, 30%

2400 m3/day x 0.3 = 672 m3/day

28m3/Hr

1120m3+672m3 = 1.792m3=1800m3--Aeration Tank Capacity

5) Retention time:

2240m3/day -:- 24 Hr = 9303 m3/Hr = 94 m3/Hr

1800 m3 -:- 94m3/Hr = 19.01 = 19Hr

* Attachments

1. Air diffuser : air distribution pipe sparger

2. Blower :

Valume of the air (compressor-Air)

1) controlling Tank 20m3/min

2) Aeration Tank 30m3/min

1) + 2) 20m3/min + 30m3/min = 50 m3/min

50m3/min x 1.4 = 70 m3/min

(Dimention)

- Type: Turbo-type Blower

One side in 5stps, motor-direct

Suction pressure - 250mm/Ag

revalution per minuts 2000-3000 r.p.m

Motor: 120 KWH x 3000 volt

3. Instrumentation

Type : (PHI) automatic contral system lset

2-5 Settling Tank

Components / Item	Type Material	Dimension(m) Diameter(H)	Capacity (m3)	Space requirement(m2)
settling Tank	sludge collector concrete	(D=16.2m) x2	400	200

Retention time : 4.2 hrs(94m3/Hr)

* Attatchements

1. Sludge collector : Scraper - type
2. reduction gear included machine-Motor
   reduce speed, 1 revolution per 30 minutes

2-6 Sludge Tank

Components / Item	Type Material	Dimension(m) (W) (L) (H)	Capacity (m3)	Space requirement(m2)
sludge Tank	concrete	4 x 5 x 3	60	20

retention time one day--sludge of by-product(excess sludge)

*Attatchments (Sludge disposal)

1. Sludge transfer pump 1set
2. truck away ---- drying solar heat bed
   (W) (L) (H)
3. sand bed size : 6m x 12m x 0.5-0.7m 10set
4. weight ton of sludge produced annually
   044ton/day.dry x 360day/year = 158.4 ton / year
   (fertilizer for Agriculture)

2-7 I. sterilizing Tank

Components / Item	Type Material	Dimension(m) (W) (L) (H)	Capacity (m3)	Space refuirement(m2)
sterilizing Tank	chlorine gas concrete	2 x 6 x 2	24	12

Retention time 15 minutes

*Attachments

1. (5 bottle) I liquied cylinder to contain 5-7 ppm

2. Sparger (for cholrine gas) one set

Liquified chlorine gas (Subsequently referred to as chlorine) is soluble in water. The reason of used the Dominance waste water is that practically all waste water contains ammonia and most of the chlorine applied is very rapidly converted to chlorine gas at waste water PH of slightlg above 7.0 .

Arrangement of Building area

No	Item	Site	Space requirement (m2)	
1.	Compressed-Air flotation	Tank		12
2.	Controlling	Tank		440
3.	Aeration	Tank	450	650
4.	Settling	Tank	200	
5.	Sludge	Tank		20
6.	sterilization	Tank		12
7.	steel sheet etc (total)	Tank		8

Total 1.470m2

Wag + 158

Building area- - - - 1.300m2

Initial cost (construction cost)

No	Economical plant / Item	Capacity etc	LE/cost LE
1.	Concrete Tank	4.484m3	452.600
2.	Steel sheet etc Tank	20m3	18.000
	sludge collector	1set	
3.	Instrumentation	PHIC 1set	155.000
	electric	PHI 1set	
4.	Piping	D: 150mm SGP 100m	70.000
		D: 125mm SGP 70m	
		D: 65 mm PVC80m	
		D: 125mm PVC200m	
5.	Pump and Motor	39 KW	16.500
6.	Motor & reduce speed a machine	16tp	10.500
7.	Blower		600.000

It Sums up to - - - - 1.710.500 LE

Total - - - - U.S.$ 1.267.037

Running Cost

Item	component	consumption A Unit price	weigh or volume (day)	day per operating expenses LE/day	annual operating expenses LE/year. 360 day LE
1.	Power (Electric)	0.2LE/KWH	1300KWH	260LE	93.600
2.	Chemical		10% NaoH		
	NaOH(conc)	360LE/ton	as2ton	72	25.000
	CL2 liqured	1.25LE/Kg	11.2kg/ day	14	5.040
3.	Worker	2000LE/year	5men	17	6.000
				363 LE/day	130.560 LE/Year

NOTE: no use Utility (fresh water, gas. steam)

*Average daily amount of waste water treated volume 2.240 m3/day

(1)	One day running cost	363 LE/day
(2)	Year running cost	130.560 LE/year
(3)	BOD kg operating expenses	0.45 LE/kg-BOD
(4)	Waste water m3 per operating expenses	0.16 LE/m3

Investiment Cost (Total)

1. Construction area	way + 158m2 - - - 1.300 m2	
2. Construction Cost	1.022.450 LE (US$ 757.370)	
3. Running Cost		
One day running cost	363LE/day.	$268/day
Year running cost	130.560LE/day	$76.711/year
BOD Kg operating expenses	0.45LE/kg-BOD	$0.33/Kg-BOD
Waste water m3 per operating expenses	0.16LE/m3	$ 0.118/m3

NOTE: 1 U.S.$ = 1.35 LE

Section - 4 Kaha CO. Badrashin

Site Visit :

1. Place of Factory :
   EL NASR CO. FOR PERSERVED FOOD "KAKA" Badrashin

2. Site Visit of day :
   1st: 9 November 1986
   2nd: 16 November 1986
   3rd 19 November 1986

3. GOPI Visitors
   Egnr. Ali El Sisi
   Engr. Hoda William
   Engr. Eglal Moustafa
   Engr. Mr. Abd EL KADER(EL NASR COMPANY FOR MANAPACTURING COKE AND CHEMICALS
   ----- Makio Nakashio (Japanese)

4. Company Personel
   1) Factory manager : Engr. Mr. Said shalaby
   2) Person in charge: Engr. Mr. Mohammed Abdel Hamid Kharib

Description of Process (flow-sheet)

1. Planning establish terms

(1) The basis for planning

1) volume of industrial waste water
V = 1120 m3/day (70 m3/Hr)

2) work operation 16hr
Friday is a holiday

3) on a two-shift- a - day basis

(2) water quality of

1) industrial waste water

			Effluent Standard	
PH	7.5		PH	6-9
BOD	2.142	ppm	BOD	30ppm
COD	2.728	ppm	COD	30ppm
SS	261	ppm	SS	30ppm
Oil & grease	160ppm			

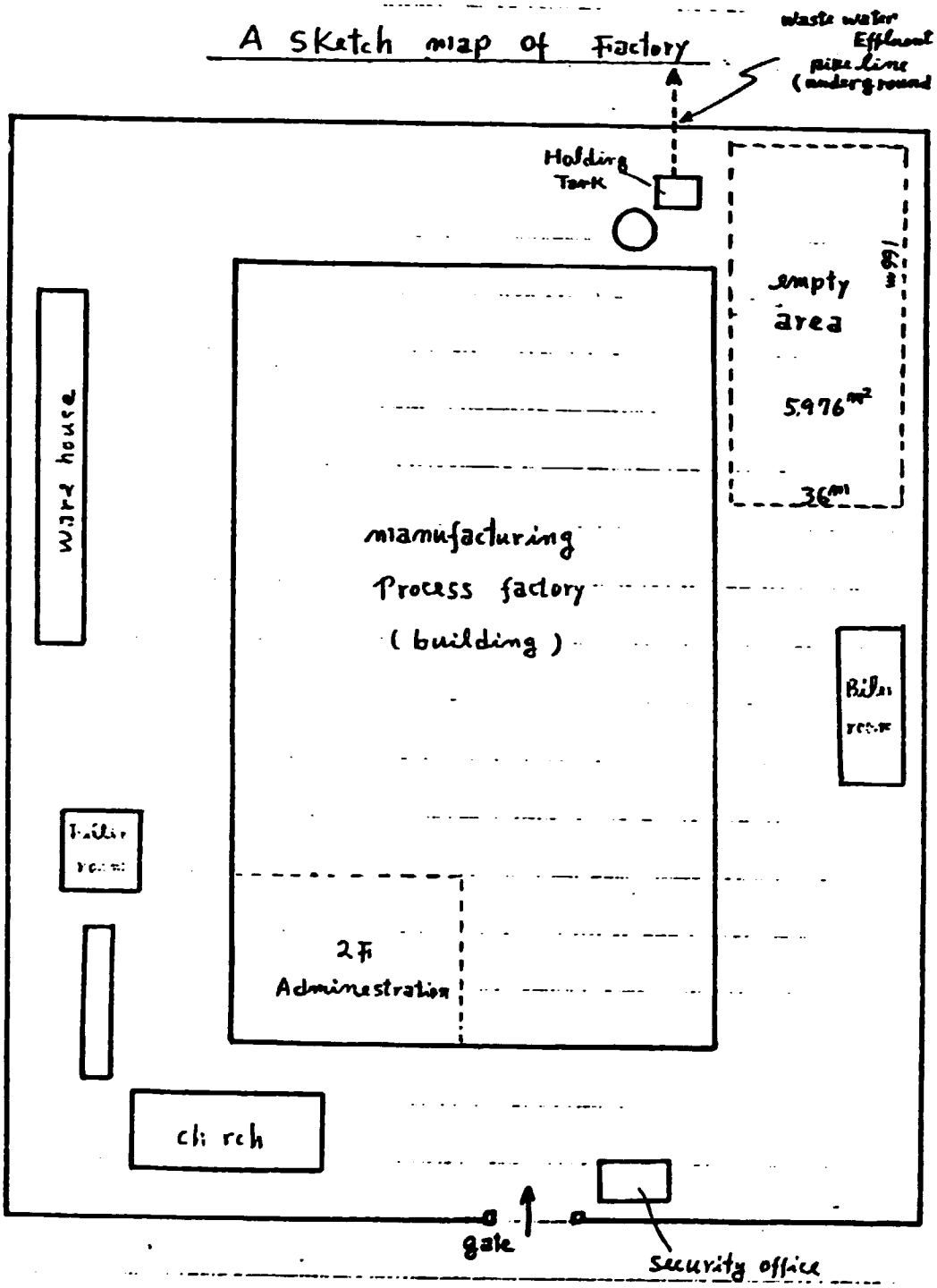
2)A unit cost of city tap-water 0.1LE/m3
" Electric 0.2LE/KWH

3)Personnel(worker)expenses per year
2000LE/year

4) The empty area, about 6000m2

Badrashin Factory (Cairo-City)

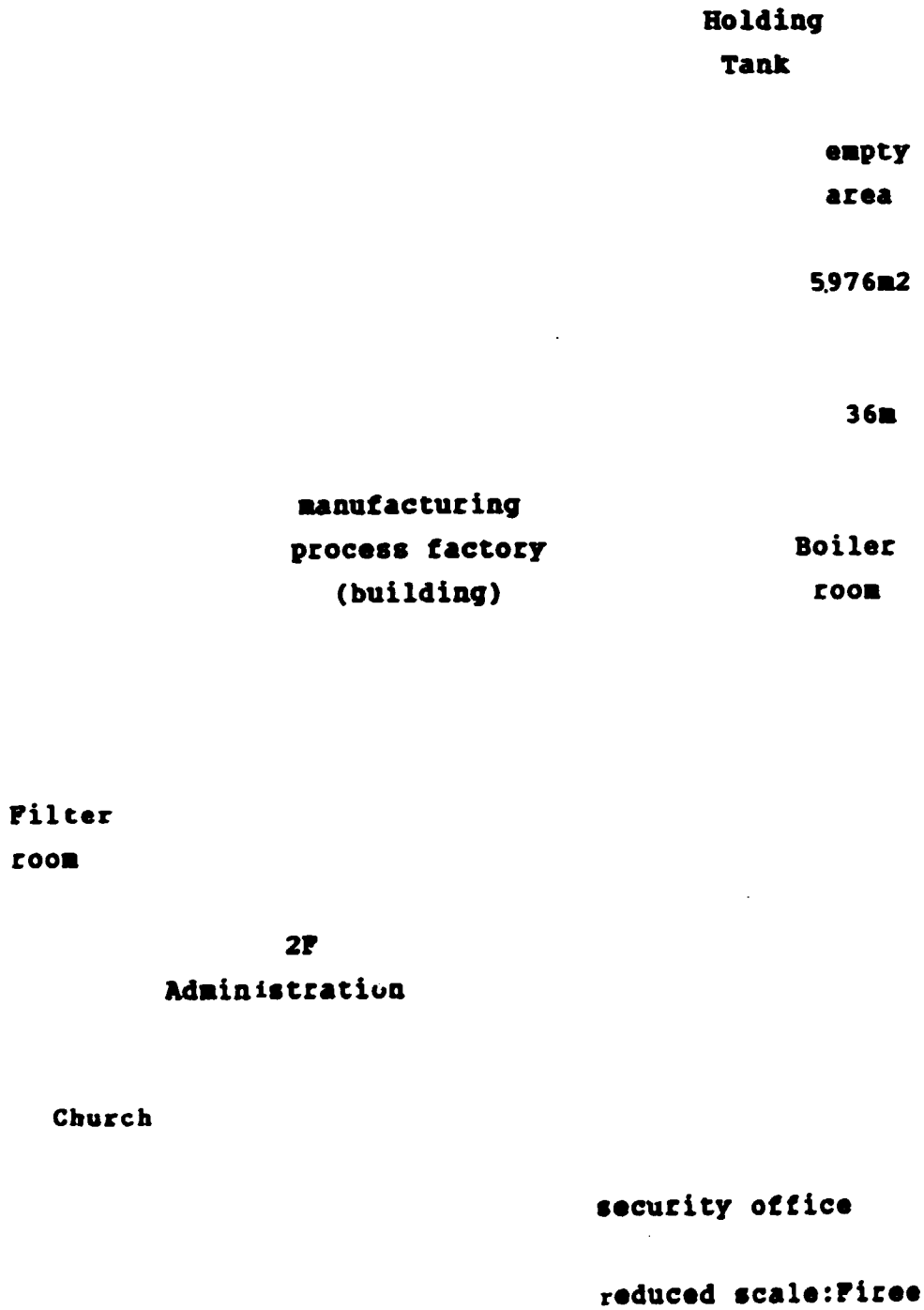
A Sketch map of Factory



reduced Scale : Free

Badrashin Factory (Cairo-City)

A Sketch map of Factory



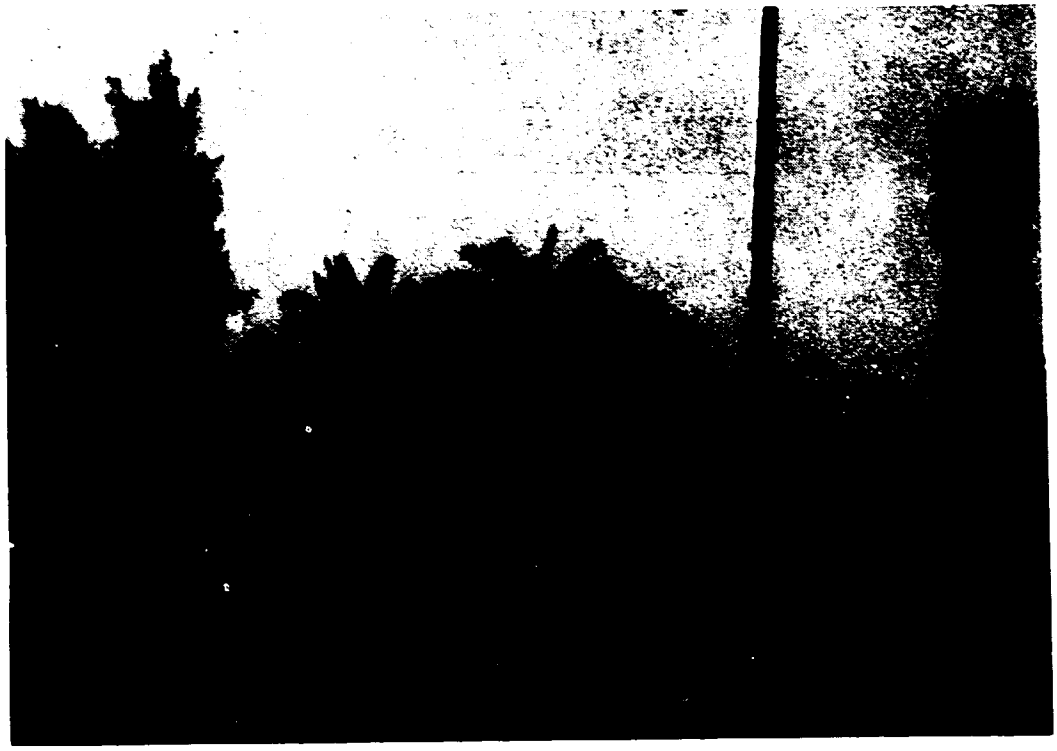


Photo: 1 outside view for the kaha Factory at badrashine

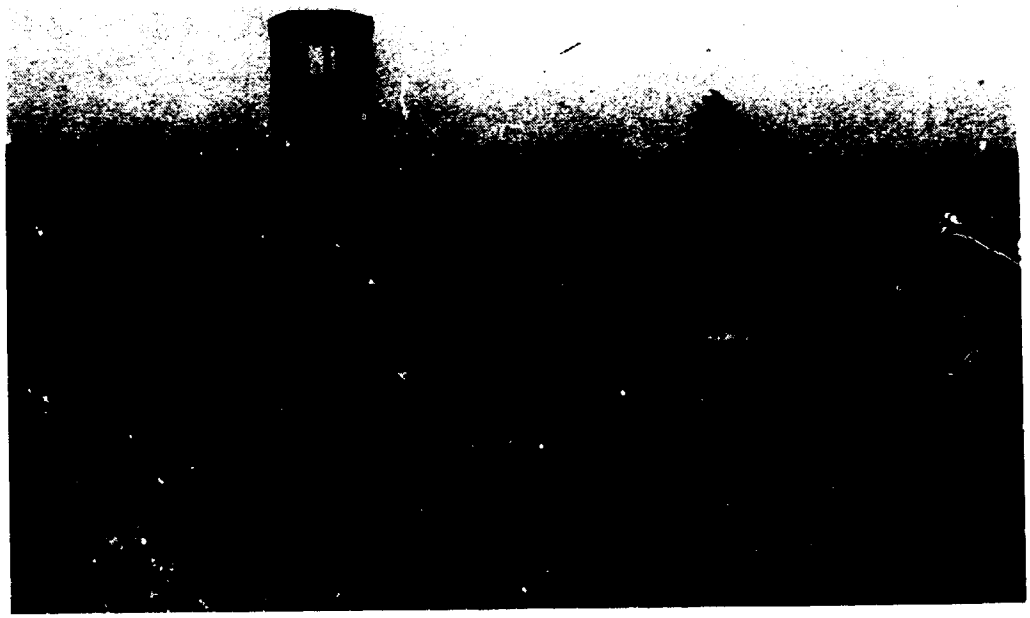


Photo:2. Available area suitable for the futur treatment plant.

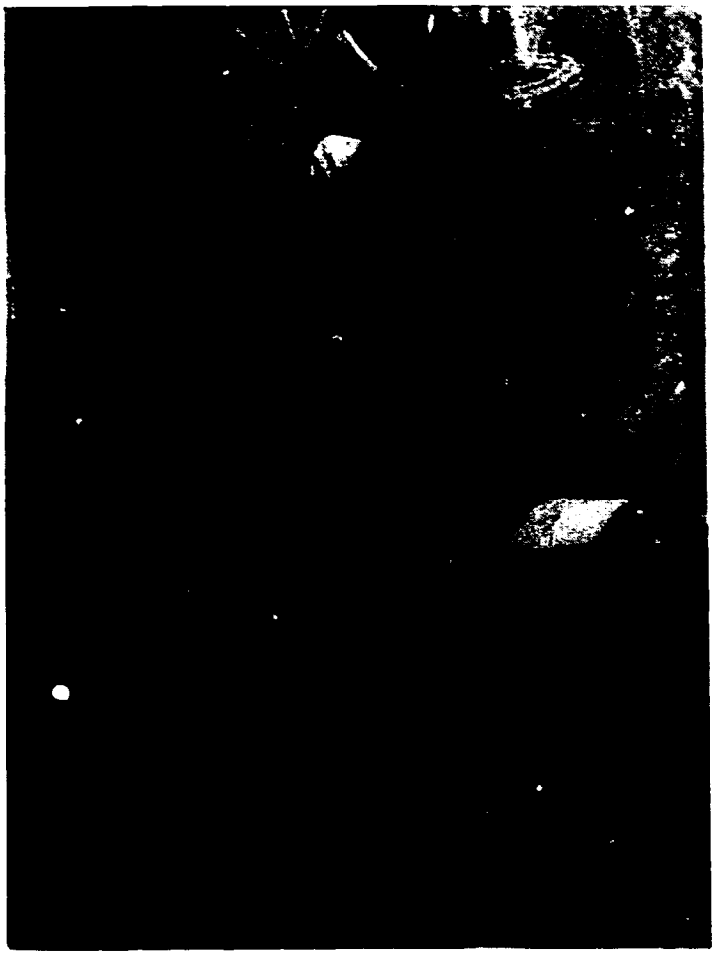


Photo: 3. one point of industrial waste water discharge

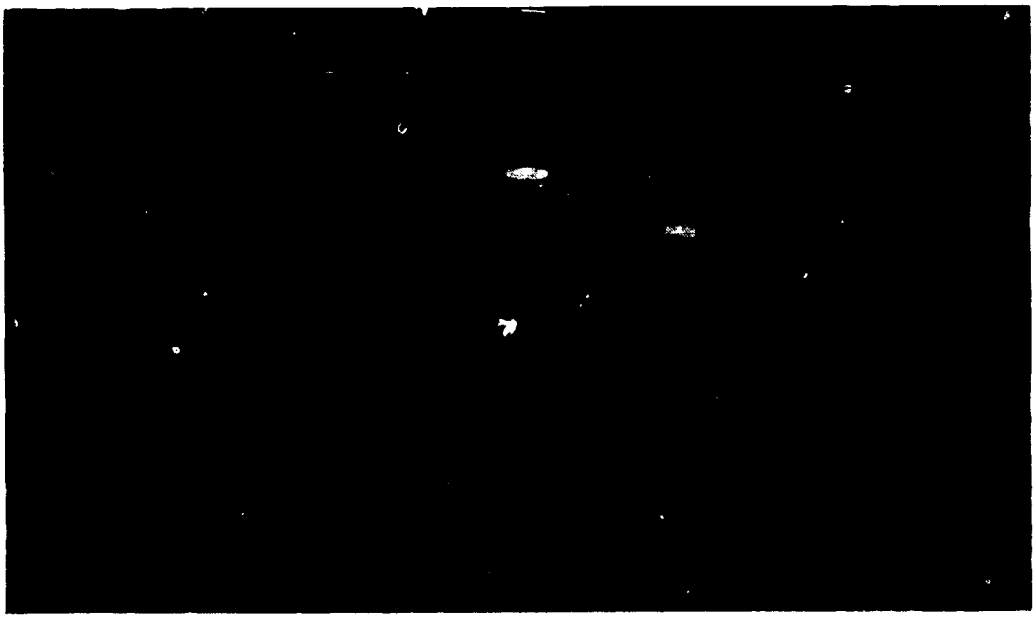


Photo: 4. sedimentation test- samples taken to make analysis in the lab of coke company

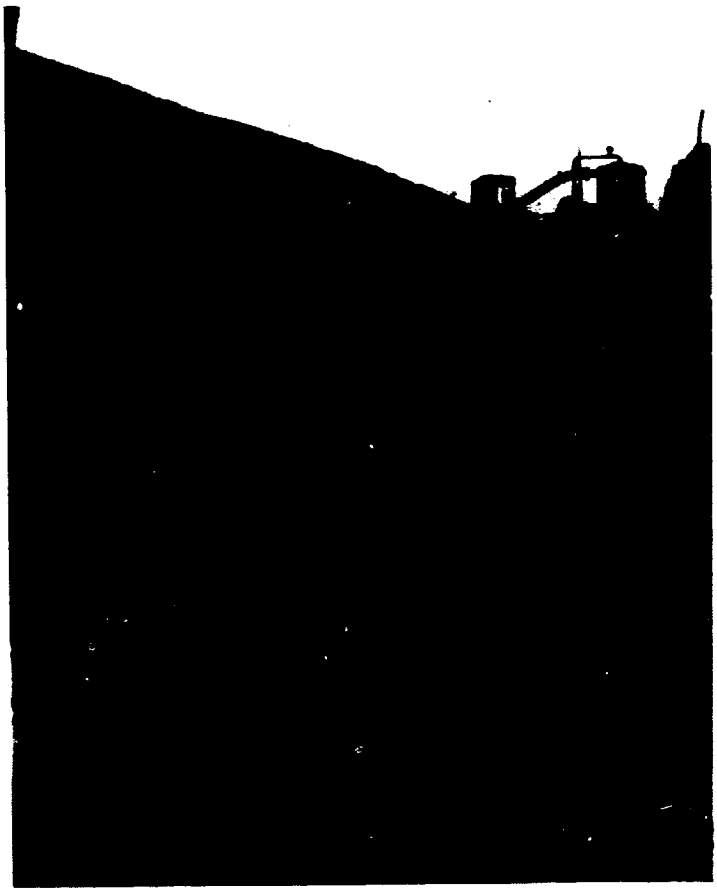


Photo: 5. side view of the wall of the chambers of pickling

Photo: 6. many chambers where olives is pickled.

Photo : 7. Outside view of one chamber where olives is pickled

Photo:8. Final discharged point of industrial waste water to the drain

2. Plant Description (Major Equipment specification)
The flow-sheet diagram and the material inletee and effluent of calculation is shown in Fig .

2-1. Bulk refuse recovery equipment (in side the Factory)
This equipment consists of "Kaha" Factory same one .
see Photo 1 and 2 (page 48)

2-2. Mixture Tank

Components / Item	Type Material	Dimension(m) (W) (L) (H)	Capacity (m3)	Space requirement(m2)
Mixture tank	empty concrete	2 x 5 x 2m	20	10

Retention time : 15 minutes

2-3. Coagulation Tank

Components / Item	Type Material	Dimension(m) (W) (L) (H)	Capacity (m3)	Space refuirement(m2)
Coaqulation tank	concrete	1.5x12 x 2m	35	18

Retention time : 30 minutes

* Attachments

1. Agitation :

   1) quick agitation, 120 r.p.m (1.5 1 sec. speed) Motor : reduce speed of a machine 3HP Retention time 5 minutes

   2) Slow agitation, 30 r.p.m (30cm/sec. spped) Motor : reduce speed of a machine 5HP Retentian time 25 minutes

2. Al2(SO4) Storage Tank (Coaglant)---1.000-1.500ppm/m3

Capacity	20m3
Dimension	D =2.7m x3.5m (H)
material	steel sheet
space requirement	8m2

3. PAC (polimer, coaglant aids) ---concentration of use 20ppm/m3

Capacity	1m3
Dimension	D=1m x 1m (H)
material	steel sheet
space requirement	1m2

2-4 Sedimentation Tank

Components / Item	Type Material	Dimension(m) Diamenter(H)	Capacity (m3)	Space requirement(m2)
Sedimentation tank	Sludge collector concrete	(D=6.7m) x 2	70	50

Retention time: 60 minutes

* Attachments

1. Sludge collector : Scraper-type
2. reduction gear included a machine-Motor reduce speed, one revolution per 30 minutes
3. incinerater
   1) Sludge drow pump one set
   2) Sludge incinerator (compact-type)

2-5. Controlling Tank

constructed tank divertion by the Factory

Components / Item	Type Material	Dimension(m) (W) (L) (H)	Capacity (m3)	Space requirement(m2)
controlling tank	Aeration Agitation Blower	6 x70x2.5m	1.000	none

Retention time : 1120m3/day -:- 24hrs= 46m3/hrs

1000m2 -:- 46m3/hrs= 22hrs

* Attachments

1. 20% NaoH Storage Tank
   (in side tank resin treated coating)
   Capacity 12m3
   Dimension 2.1m x 3.5 m
   material steel sheet
   space requirement 5m2

2. 20% H2 SO4 Storage Tank(in side tank rubber coating)
   Capacity 12m3
   Dimension 2.1m x3.5m
   material steel sheet
   space requirement 5m2

3. Instrucmentation
   Type (PHIC) automatic control system 1set (PH indicate contral)

4. Airdiffuser: air distribution pipe
   sparger

2-5 Dilution Tank

Components / Item	Type Material	Dimension(m) (W) (L) (H)	Capacity (m3)	Space requirement(m2)
Dilution tank	empty concrete	2 x 3 x2	12	6

Retention time : 15 minutes
weste water : 1.120m3/day -:- 24Hr = 46.6 = 47 m3/Hr
47m3/Hr x 1/4 = 12 m3/Hr

1) fresh water (city tap-water) 1120 m3/day for dilution
2) incoming BOD,1600 ppm x.5of BOD 800ppm (send to Aeration tank)
3) Retention time 1120m3/day + 1120m3/day = 2240m3/day
   7.5 minutes
   2240m3-:- 24Hr = 93.3 m3/Hr = 93 m3/Hr

2-6 Aeration Tank

Components / Item	Type Material	Dimension(m) (W) (L) (H)	Capacity (m3)	Space requirement(m2)
Aeration tank	Aeration Agitation concrete	22x29.3x4 (11x2)	2600 1300x2	325 650 325

1) BOD loading 0.8 Kg-BOD/m3. day

2) incoming wast water quality : BOD 800ppm

3) Total BOD 0.8 Kg-BOD/m3x2.240m3/day = 1.792Kg-BOD/day

$$\frac{1792\text{Kg-BOD/day}}{V} = 0.8$$

$$V = 2240\ m3$$

4) Return sludge rate 30%-15%

2.240 m3 + 360 m3 = 2600 m3--Aeration Tank Capacity

5) Retention time : 2240m3day-:- 24hrs= 93m3/hrs

2600m3-:- 93m3/hrs= 28 hrs

* Attachments

1. Air diffuser : air distribution pipe
   sparger

2. Blower:
   Volume of the wind (Compressad-Air)
   1) controlling Tank 54 m3/min
   2) Aeration Tank 74/m3/min
   1) +2) 45m3/min+74m3/min= 128m3/min
   128m3/min x1.4 = 180m3/min

(Dimention)

Type: Tobo-Type Blower 2 set
one side in 5 step Moter-direct
suction pressure - 250mm/Ag
revolution per minuts 2000-3000r.p.m.
Motor : 120 KW x 3.000volt

3. Instrumentation
Type : (PHI) automatic control system, 1set

2-7 Settling Tank

Components / Item	Type Material	Dimension(m) (W) (L) (H)	Capacity (m3)	Space requirement(m2)
Settling tank	sludge collector	11x 11 x 2	480	121
	concrete		240x2	242 121

Retention time : 480 m3 -:- 93 m3/Hr = 5.1 Hr

* Attachments
1. Sludge collector : Scraper-type
2. reduction gear included machine-motor
reduce speed, 1 revolution per 30 minutes

2-8 Sludge Tank

Components / Item	Type Material	Dimension(m) Diameter (H)	Capacity (m3)	Space refuirement(m2)
Sludge tank	concrete	(D=2.7m x 4m	160	52

Retention time : one day ---- sludge of by-product (excess sludge)

*Attachments (Sludge disposal)

1. sludge tranfer pump one set

2. truck away --- drying sola heat bed
(W) (L) (H)

3. sand bed size : 60 x12mx0.5-0.7m 20 set

4. weight ton of sludge produced annually
1.186Kg/day.dryx360day/year = 424.8ton/year
(fertilizer of Agriculture)

2-9 I. sterilizing Tank

Components / Item	Type Material	Dimension(m) (W) (L) (H)	Capacity (m3)	Space refuirement(m2)
I. sterilizing tank	chlorine gas concrete	2 x 6 x 2	24	12

Retention time : 15 minutes

*Attachment

1. I liquid cylinder(5-7 ppm)7 bottle

2. sparger (for chlorine gas) one set

Arrangement of construction area

No	Item	Site	Space requirement (m2)
1.	Mixture	Tank	10
2.	Contralling	Tank	18
3.	Sedimentation	Tank	50
4.	Contolling	Tank	---
	constructed Tank diversion		
5.	Dilution	Tank	6
6.	Aeration	Tank	650 892
7.	Settling	Tank	242
8.	Sludge	Tank	52
9.	Cl Sterilizing	Tank	12
10.	steel sheet etc,	Tank	25
		Total	1.065m2
		Wag +	135m2
		Area- - - -	1.200m2

Initial cost (construction cost)

Item \ Economical plant		Capacity	LE/cost
1.	Concrete Tank	3401 m3	380.000
2.	Steel sheet etc Tnak	44m3	51.000
	sludge collector	2 set	
3.	Instrumentation	PHIC pne set	160.000
	contented wiring work	PHI one set	
4.	Pipe laying	D 155mm SGP120m	99.000
		D 150mm SGP100m	
		D 75mm SGP200m	
		D 65mm PVC250m	
5.	Pump and Motor	52.5 KW	21.000
6.	Motor & reduce speed a machin	25HP	33.700
7.	Blower		90.000
8.	Bulky refuse recovery equipmnet		75.000
		It Sums up to - - - -	909.700 LE
		Total ----------U.S.$	673.851

Running Cost

Item / component	consumption A Unit price	weigh or valume (day)	day per operating expenses LE/day	annual operating expenses LE/year. 360 day LE
1. Power (Electric)	0.2LE/KWH	4.320KWH	864LE	311.040
Top-water(city)	0.1LE/m3	1.120m3/	112	40.320
2. Chemical				
Al2(SO4)3	875LE/ton	1.7ton	1500	540.000
PAC	19LE/KG	22.4kg	425	153.000
20%H 2SO4	Little use	no culculation	--	--
20%NaoH				
Cl2 liquid	1.25LE/Kg	11.2Kg	14	5.040
3. Labor	2000LE/year	4men	17	6.000
			2.932LE/day	1.055.400 LE/Year

*Average daily amount of wast water treated volume
V=1120m3/day in the case BOD 2452ppm-Total BOD-2746kg-BOD/day
V=2240m3/day in the case BOD 800ppm

(1) running cost per day 2.932LE/day
(2) running cost per day 1.055.400 LE/year
(3) BOD-kg per operating expenses
2932LE-:-2746Kg-BOD/day = 1.067=1Le/Kg-BOD
(4) Waste water m3 per operating expenses
2932LE/day -:- 2240/m3day = 1.308=1.3Le/m3

Investiment Cost (Total)

1. Construction	way + 135m2 - - - 1.200 m2
2. Construction Cost	909.700 LE (US$ 673.851)
3. Running Cost	
runnirg cost per day	2.932LE/day
running cost per day	1.055.400 LE/day
BOD Kg per operating expenses	1 LE/Kg-BOD
Waste w&ter m3 per operating expenses	1.3LE/m3

CONCLUSION

This project was supported partly by GOFI and by the four food companies.

Perhaps the most important contribution for all the project in the final analysis, has been the demonstration of cooperation in solving the problem of the industrial waste water treatment by all parties concerned .

It is believed that the same methodology which was demonstrated by the present study could be applied in the search for answer to many other problems in this field.

These conclusion are listed in the following result

1. That is not the way to do introduction of foreign techniques from America, Germany and Japan etc for measure against pollution for EGYPT. This techniques do not apply very easy.

2. The investment cost of economical treatment plant in EGYPT is more cheaper in comparison with that in America, Germany, Japan.

3.	(Construction Cost)	(operating expenses)
-	Pepsi Cola Co. 1.022.450 LE	0.85 LE/Kg-BOD
-	EDFINA Co. 1.376.000 LE	0.38 LE/Kg-BOD
-	Kaha(Kaha Co.) 1.022.450 LE	0.33 LE/Kg-BOD
-	Badrashine	
-	(Kaha Co.) 909.700 LE	1.0 LE/Kg-BOD

Annex

EGYPT & THE RIVER NILE

this report is concerned with industrial liquid wastes discharged directly to the River Nile in Egypt- through three production units which are selected by GOFI.

Egypt is located at the north eastern side of Africa. To the north side is the Mediteranean Sea, the east side is the Red Sea, the west side is the Great Sahara Desert. The area of Egypt is 1 million sq. Km. The population is now about 50 million and is expected to reach 65-70 million in year 2000. Only 6% of the land is cultivated land and the rest is desert land. The agriculture and the whole life of Egypt depend on water irrigation from the Nile.

The Nile is one of the longest rivers in the whole world. It is the main source of life for Egypt.

The historian Ephrodite has once stated that Egypt is the gift of the Nile. This is true till now; the Nile is the main source for water resource in Egypt with exception of some rainfall in the Winter.

I was told that the Pharaons used to worship the Nile and for them it was forbidden to pollute it in any way. Also the Pharaone stated in their tenples that they swear before God that they never polluted the River Nile and so they deserved Paradise. For that reason I was surprised to see that the modern Egyptians are disposing of their wastes in the Nile .

Despite the discharge of all wastes to the Nile, the Nile is still in a very good condition compared with other rivers in industrial countries in Europe.

This was due to the fact that the River Nile has a flood in the Summer time each year, washing away all the residuals and cleaning the bed. The amount of water running in the Nile each year amounts to 55 billion cu.m.

INDUSTRY IN EGYPT:

The public sector in Egypt is nowadays dominating the industrial activity. 65% belongs to the public sector. Only 35% belongs to the private sector. The public sector is governed mainly by the Ministry of Industry; but, there are some other industrial activities which do not belong to the Ministry of Industry such as production of pharmaceuticals (which belongs to the Ministry of Health). cement and building materials (which belongs to the Ministry of Housing & Reconstruction) and the production of Petroleum and Petroleum products (which belongs to the Ministry of Petroleum & Mineral Wealth). There are 117 public sector companies which belong to the Ministry of Industry; some of these industrial companies have more than one factory located in different sites, the total amounting to more than 500 different production units with a total aggreagate investment cost L.E.. 8.5 billion. The total amount of industrial production amounts in fiscal year 85/86 L.E. 7.8 billion..

This industrial production could be divided into the following sectors :

Spinning & Weaving;
Food;
Chemical;
Engineering;
Metallurgical;
Small Scale Industries; and
Mining.

As we see, the food industries represent a major part of the industrial production (25%), which give importance in taking care of the food production units and their disposals.

THE RULES AND LAWS FOR FLUID DISPOSAL OF EGYPT:(As attch'd)

There are some laws & regulations governing the liquid disposal in the sewerage network whether from industrial or municipality sources. There is also regulation for industrial waste discharged to the Nile. In this respect we will restrict ourselves with that of the Nile because the factories under investigation are located and discharging directly to the Nile.

THE LAW OF PROTECTION OF THE NILE FROM POLLUTION:

In the year 1982, Egypt issued a law for the protection of the Nile. Attached to the law are the parameters governing the quality of waste water drained directly to the Nile and its branches. Attached in Annex No. is a translation of the law in English.

According to the law all effluents must be treated before disposal to conform to the law. I was told in GOFI that this law is not applicable because of lack of investment especially foreign component. The industrial companies lack very much in foreign component. GOFI has prepared different plans for the establishing of treating units; yet, these plase plans were not implemented because of the lack of foreign currency. Also priority was selected from these plans and GOFI is trying to prepare some implementation plans based on local efforts.

INDUSTRY & LAWS OF WATER PROTECTION

Since the issue of the law for the protection of the River Nile, industry is taking all possible measures to limit pollution caused by factories of the industrial sector, especially those factories using the River Nile and its branches to dispose of their wastes.

Moreover the Ministry of Industry has contacted all the companies to make tha preliminary treatments with their available resources such as :

Eliminating oils and greases
Neutralising effluent waters
Removal of floating matter
Use of cooling water in closed circuit

The Ministry was bale during the survey to identify 188 units disposing of their wastes on waterways requiring total sum L.E. 200 million in foreign currency for treatment processes, of which :

- 32 factories disposing directly to the Rive Nile requiring L.E. 72 million for which the programme of the Ministry of Industry was prepared and approved by the Policies Committee and all executive institutes and it is being taken care of with an allocation of L.E. 14 million for the current year.

- 53 factories disposing on the agricultural lands and plans are currently being set for treatment.

- 58 factories that use the city sewerage networks at present and should apply treatment according to the law 93/1962.

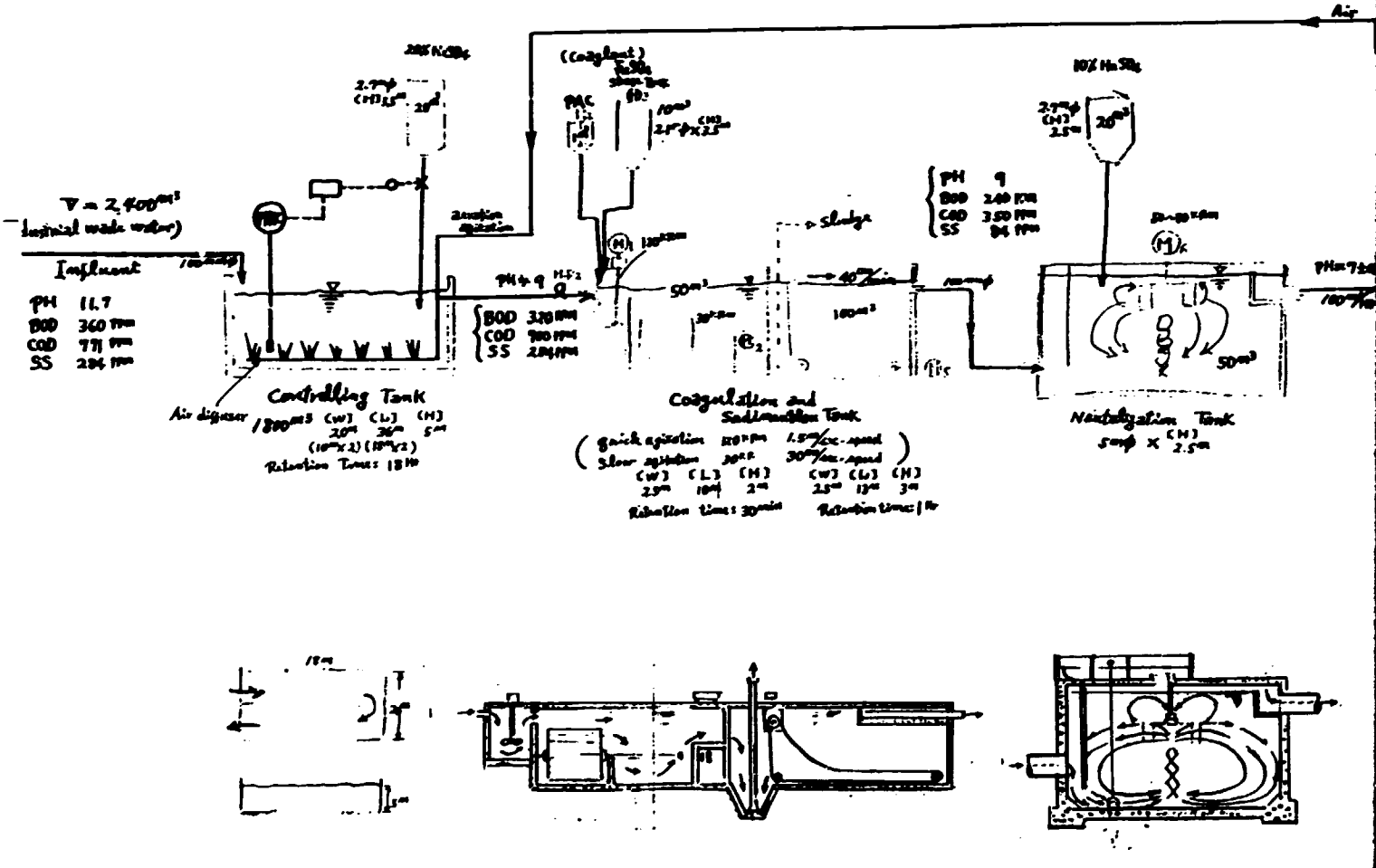
- 45 factories that will use the sewerage systems that will be implemented in the coming plans.

OUTLINE ABOUT IN. SECTOR

The industrial Sector contributes with 65% of the total industrial activity in Egypt and is affiliated to the Ministry of Industry represented in 580 production units concentrated in 330 geographical sites belonging to 117 companies. The production of these units reached L.E. 7.8 billion on the national level as follows:

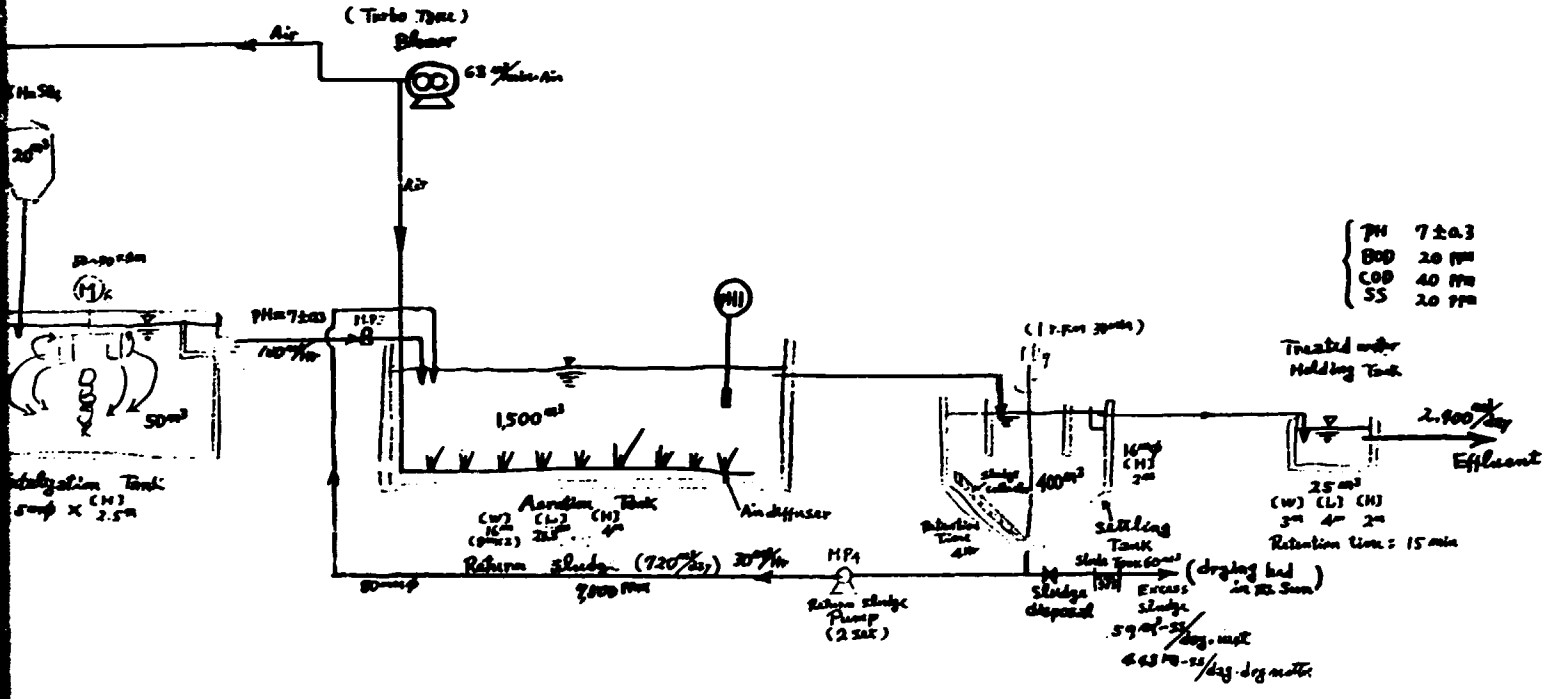
	No.of Co.	No.of unites	Percentage of prod'n
Food Industries Sector	20	144	22%
Spinning & Weaving Sector	32	193	26%
Chemicals Sector	26	97	19%
Engineering Sector	20	61	18%
Metallurgical Sector	10	49	10%
Ceramics Mining Sector	9	36	5%
			100%

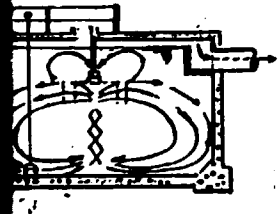
Figure 1. Pepsi Cola co. flo

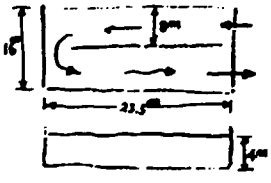


SECTION 1

Pepsi Cola co. flow - Sheet







SECTION 2

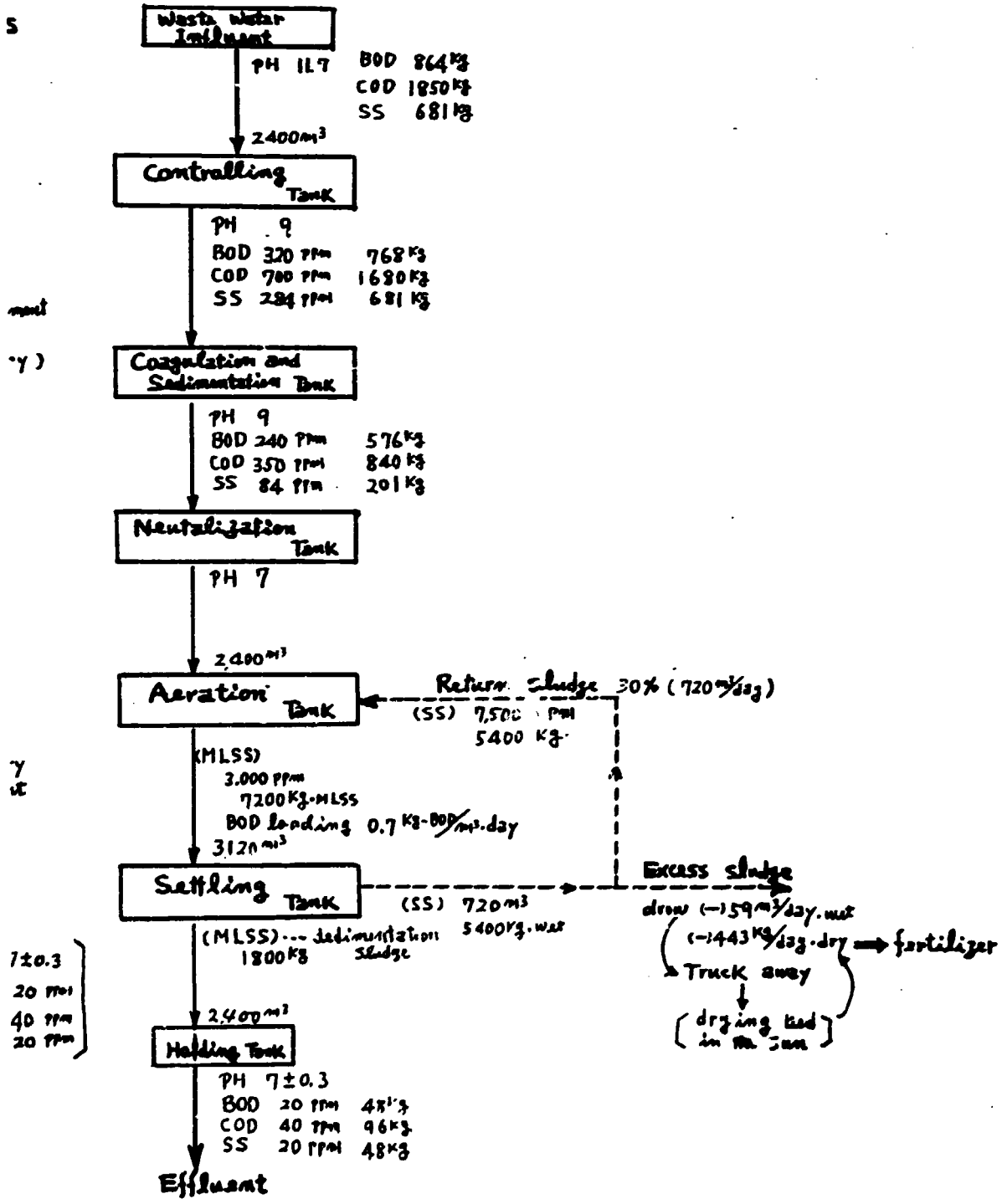
Materialistic incoming and effluent of Calculation

tion numerical value

coming waste water V = 2,400 m³/day (100 m³/hr)

ste water

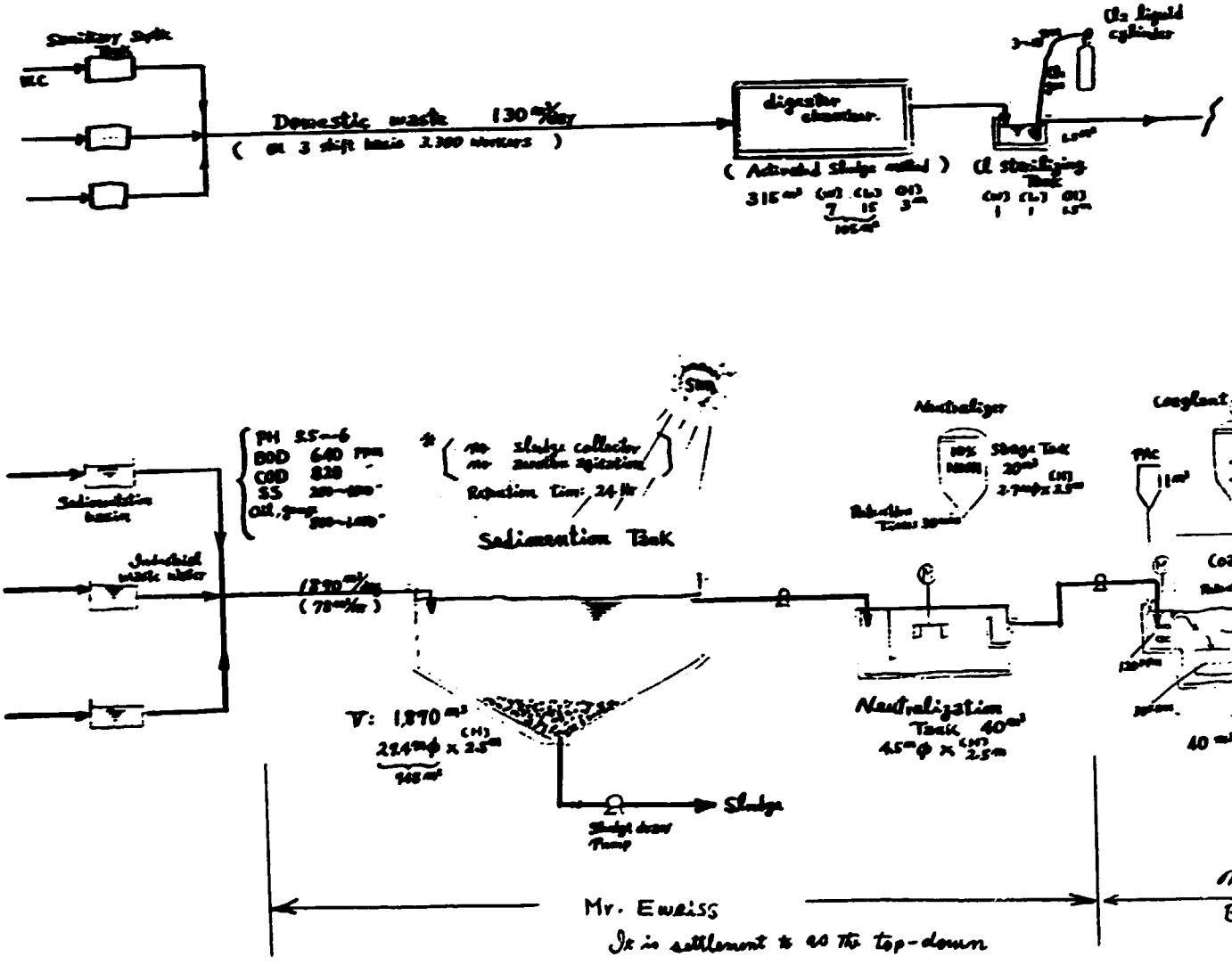
		effluent Standard
PH	11.7 →	PH 6~9
BOD	360 ppm →	BOD 30 ppm
COD	771 ppm →	COD 40 ppm
SS	284 ppm →	SS 30 ppm



15. DEC 1986
Nakashio

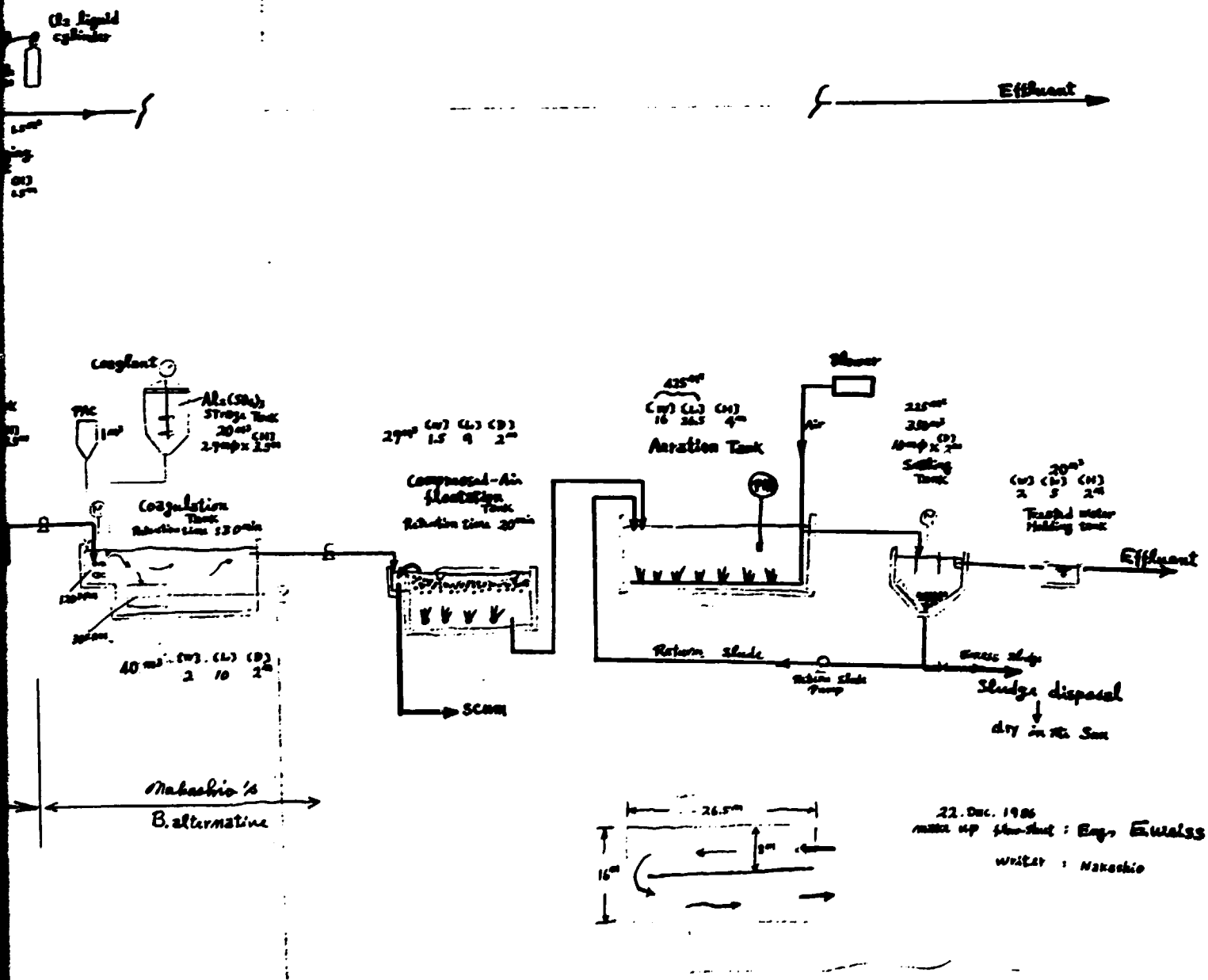
92/93

Edfina company flow



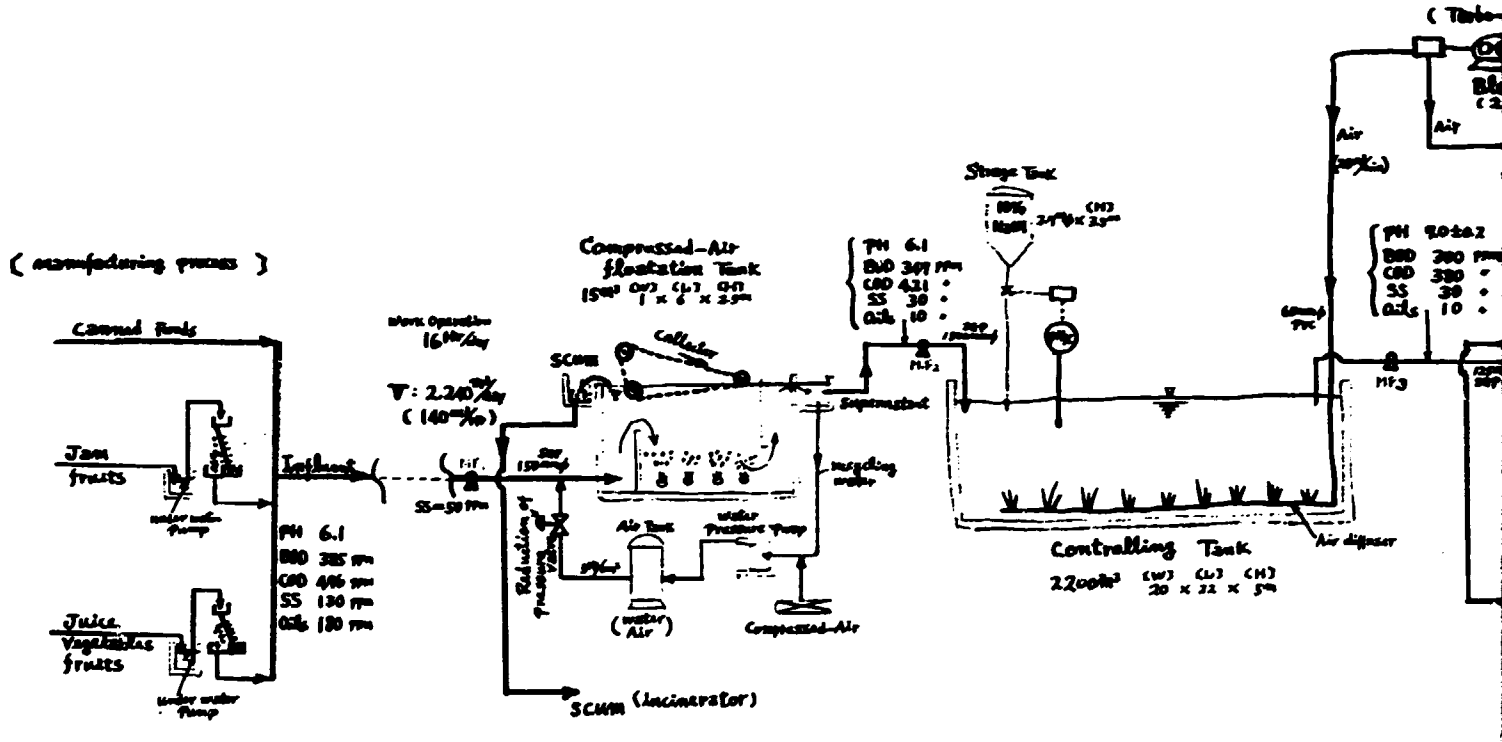
SECTION 1

...pany flow - Sheet



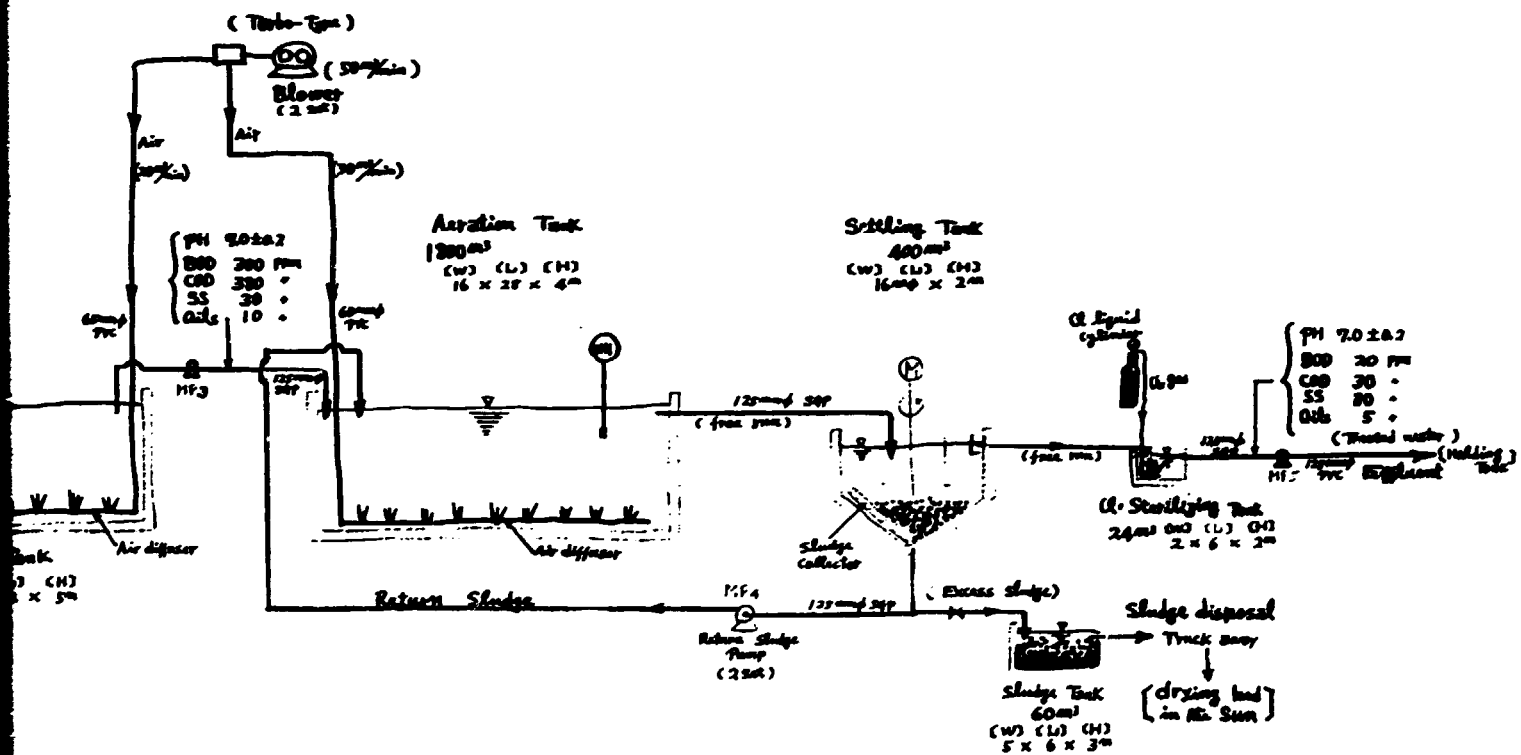
SECTION 2

Kaha co. flow-She



SECTION 1

co. flow-Sheet



25. DEC 1986
Mahasakan

SECTION 2

Materialistic incoming and effluent of calculation

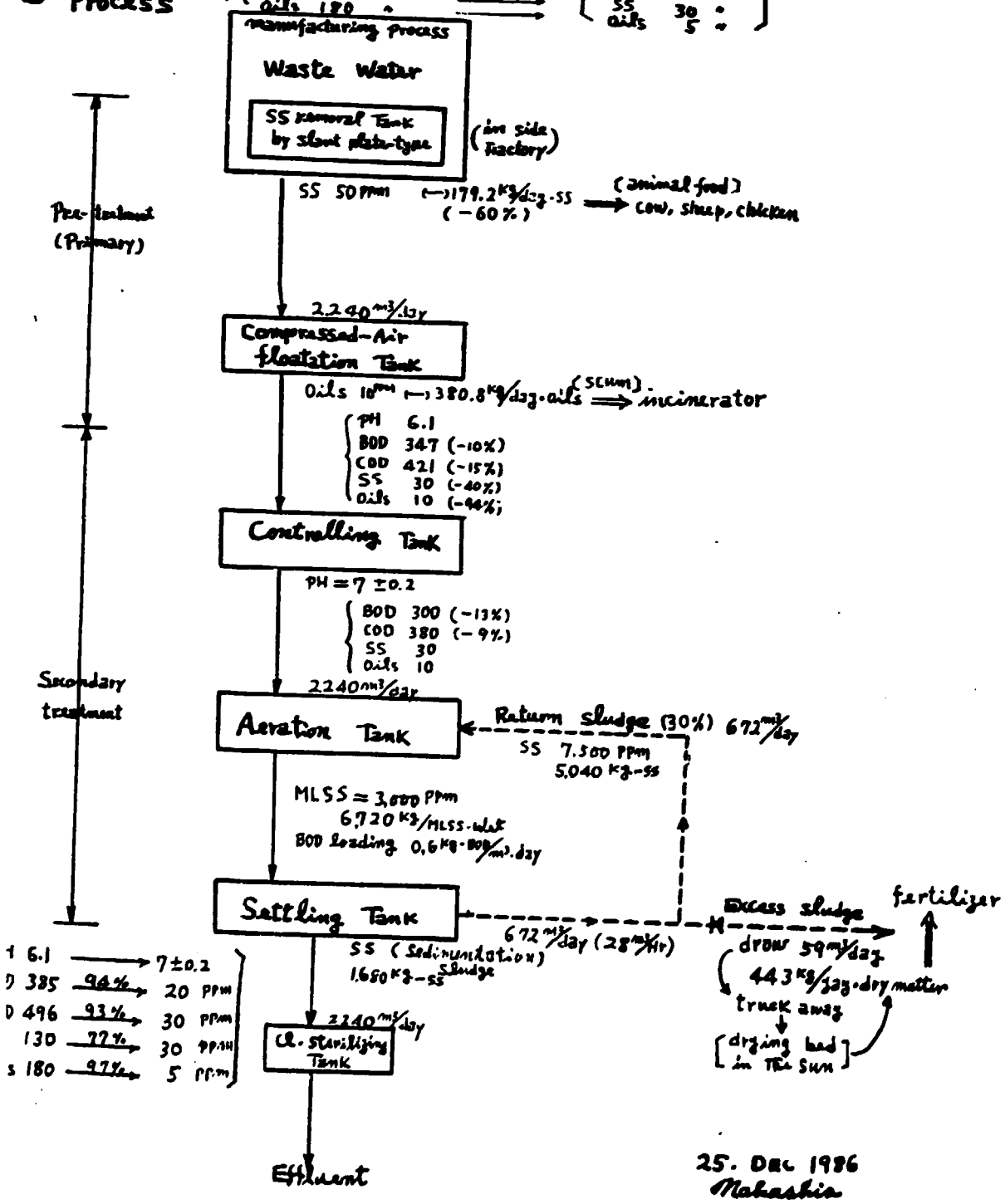
○ foundation numerical value

(1) incoming waste water $V = 2{,}240\ m^3/day$ ($140\ m^3/Hr$)
work operation 16 Hr

(2) water quality

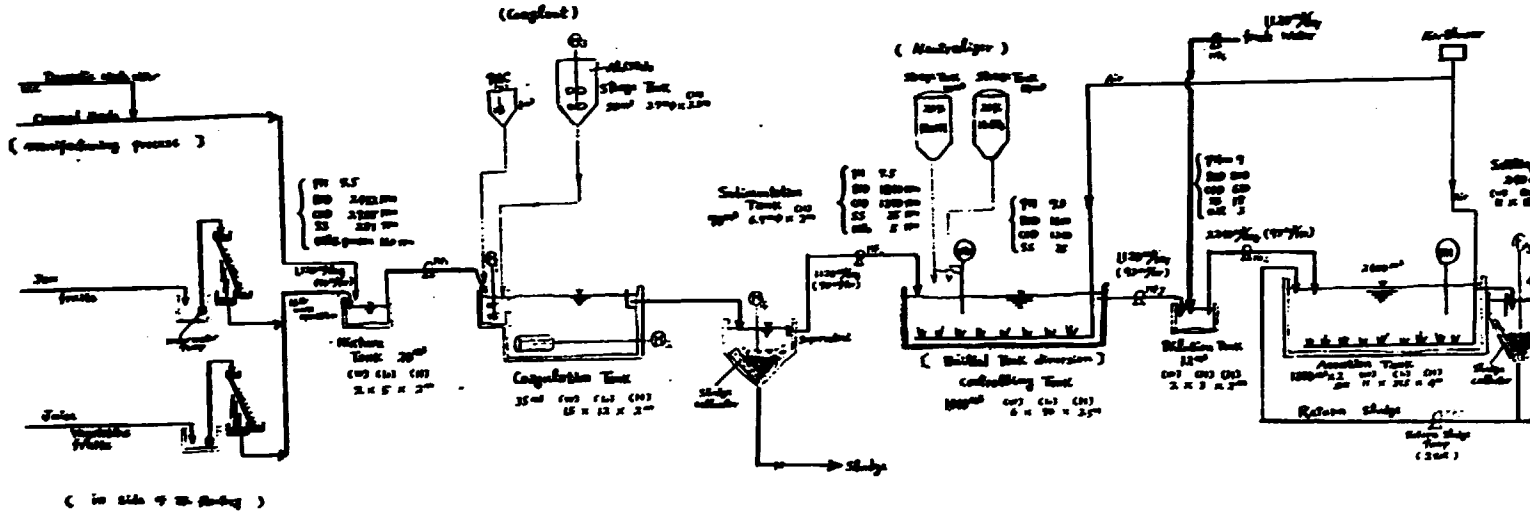
			effluent Standard	
PH	6.1		PH	6~9
BOD	385	ppm	BOD	20 ppm
COD	496	"	COD	30 "
SS	130	"	SS	30 "
oils	180	"	oils	5 "

○ Process

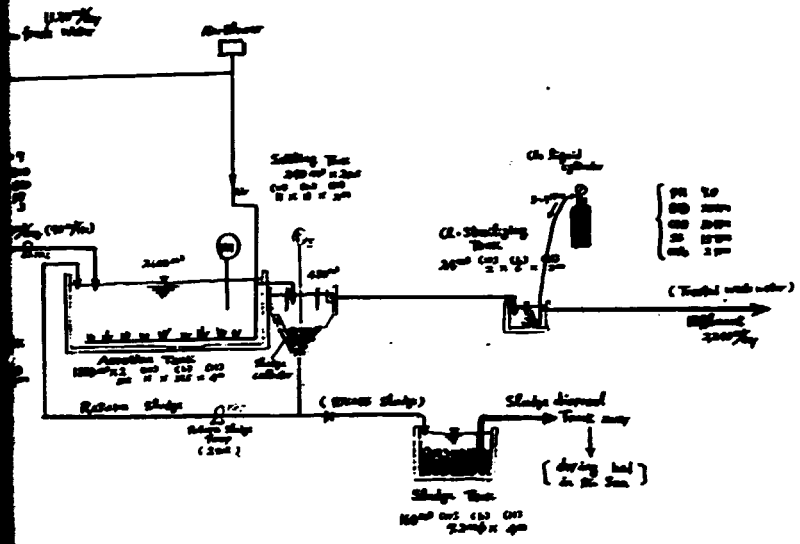


25. Dec 1986
Nakashio

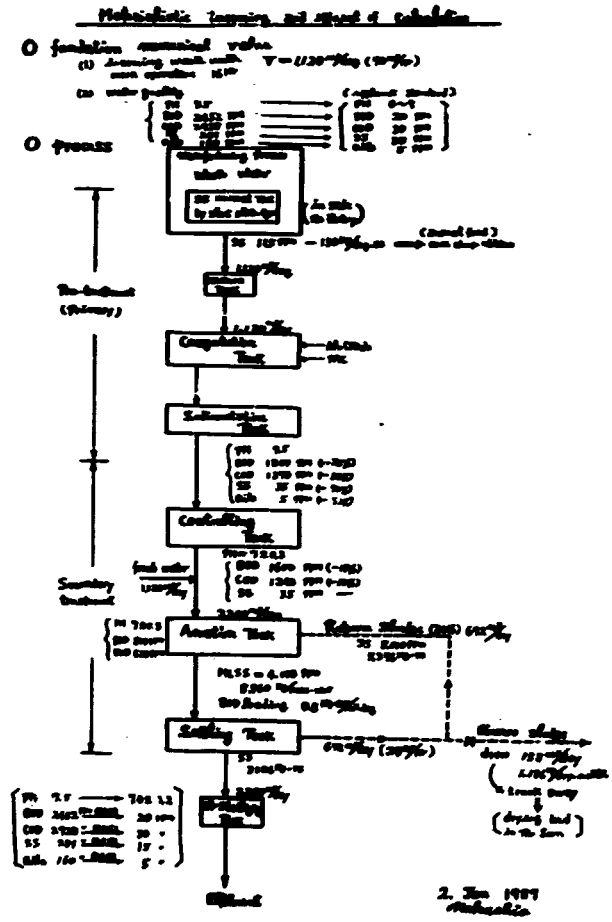
Badrashen Co. flow-sheet



SECTION 1



2. Jan 1997



2. Jan 1997

SECTION 2