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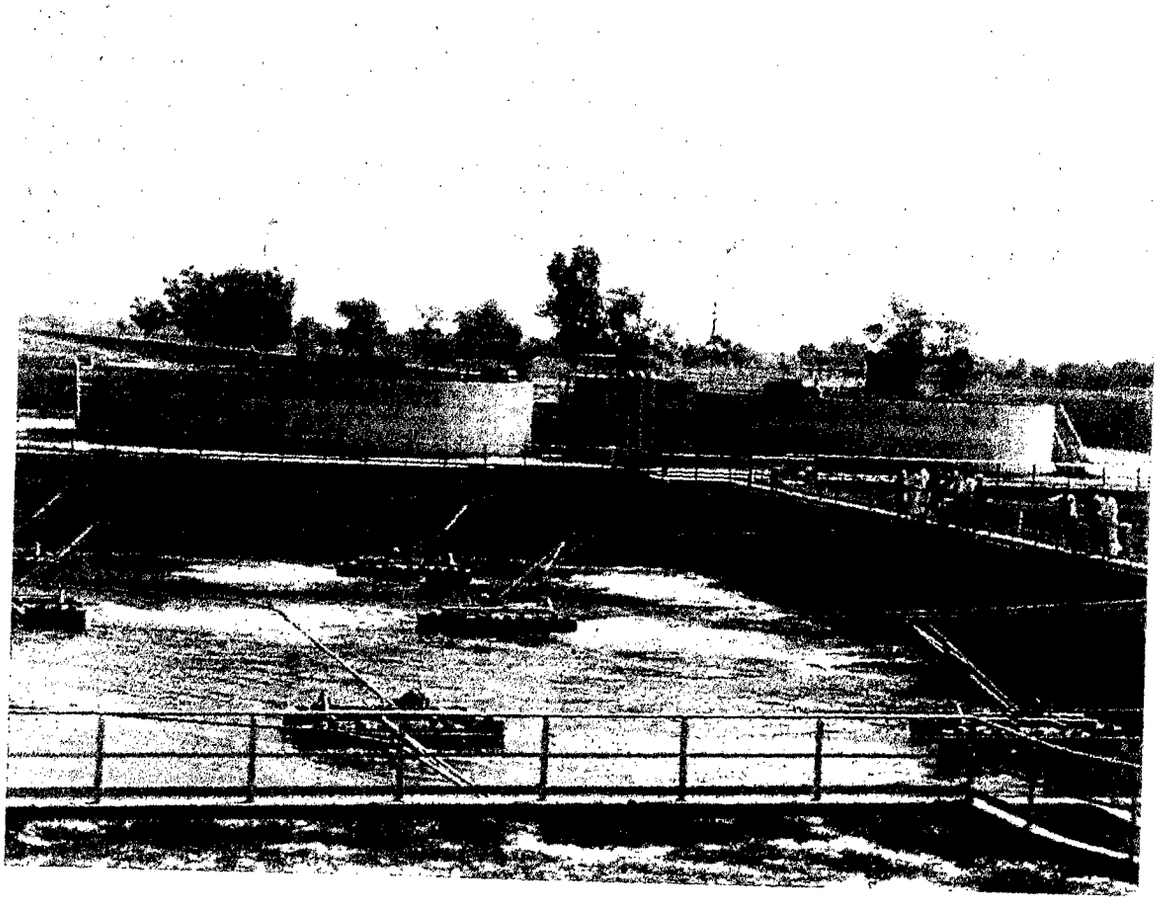
COMMON TANNERY EFFLUENT PRE-TREATMENT PLANT (ETP) AT KASUR



PROJECT FINAL COMPLETION REPORT

November 26, 2001

IN CONSULT (PVT.) LIMITED

80-AURANGZEB BLOCK, NEW GARDEN TOWN, LAHORE-54600

Tel: 042-5869560 & 5832234; Fax: 042-5869561; Email: incon@brain.net.pk

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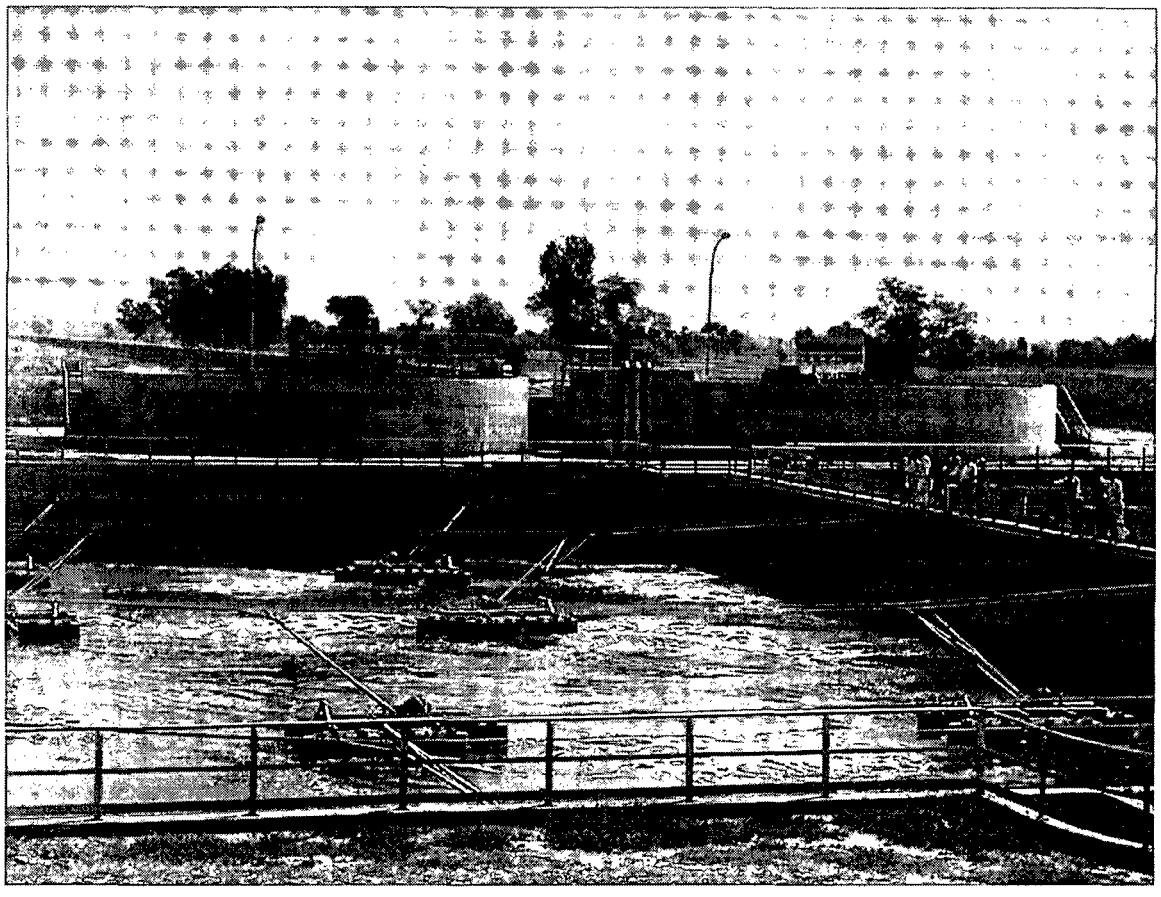

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KASUR TANNERY POLLUTION CONTROL PROJECT

Project Final Completion Report

Table of Contents

KASUR TANNERY POLLUTION CONTROL PROJECT

Project Final Completion Report

1. Project Back Ground

The project was conceived around 10 years back. TEH-PROJEKT Rejika through its field mission in 1993 studied 41 different alternatives and in the same year it was decided to construct a Common Tannery Effluent Pre-Treatment Plant CTEPTP on the abandoned railway track.

Based on the above decision, TEH-PROJEKT prepared the conceptual design of the CTEPTP. This plant is also supported by a tannery solid waste disposal site (TSWDS).

2. Funding Agencies

The project is funded by the following agencies

- Government of Pakistan
- Government of Punjab
- Export Promotion Bureau
- UNDP
- Tanner's Associations

3. The Process

The CTEPTP was based on the process of aeration. The flow is mainly by gravity and after entering into the CTEPTP the effluent is pumped only at one stage. The process mainly consists of

i. Screening
ii. Equalization
iii. Sludge separation & stabilization
iv. Sludge pumping & drying
v. Effluent treatment through aeration in lagoons
vi. Discharge into Outfall

4. Detailed Engineering

On Dec. 31, 1998, IN-Consult (Pvt.) Ltd. Lahore was hired by UNIDO, through competitive bidding, to prepare construction documentation & detailed engineering of the plant and TSWDS. The construction documentation for CTEPTP was based on the conceptual design already prepared by TEH-

PROJEKT Rejika, whereas the TSWDS was completely designed by IN-Consult (Pvt.) Ltd. The contract # 98/215/VK was signed between IN-Consult and UNIDO (for design phase) for CTEPTP & TSWDS. Construction documents prepared by IN-Consult were made the basis of bidding for construction works. This bidding was LCB (Local Competitive Bidding)

5. Project Segments

Overall Kasur Tannery Pollution Control Project consists of following segments

i. Din Garh collection system & pumping station.
ii. Younus Nagar collection system & pumping station.
iii. Effluent delivery/transport system.
iv. Common Tannery Effluent Pre-Treatment Plant.
v. Tannery Solid Waste Disposal Site.
vi. Discharge system for Pre-Treated Effluent.
vii. Associated works like culverts, drains and access roads etc.

6. Detail of Project Segments

The project's various segments comprise the following;

I. Din Garh collection system & pumping station.

i. 427 m long collector (R.C.C pipe line 30" Dia.)
ii. Pump house with three sluice valves, 2 pumps, one fixed screen and one automatically cleaned bar screen.
iii. Stand by generator set and its room.
iv. Associated electrical works.

II. Younus Nagar collection system & pumping station

i. 840 m long collector (Open drain 2' wide 2' deep)
ii. Pump house with three sluice valves, 2 pumps, one fixed screen and one automatically cleaned bar screen.
iii. Stand by generator set and its room.
iv. Associated electrical works.

III. Effluent delivery system

i. Pucca drain 1280 m long.
ii. Prolongation of pucca drain 1422 m long.
iii. 550 m long Fiber Glass Pressure Pipeline

IV. Common Tannery Effluent Pre-Treatment Plant (CTEPTP).

A. Civil Works

- Control Building
- Screen House
- Tubewell Room
- Firefighting Room
- Supply Channel
- Culvert under Depalpur Road
- Equalization Tanks
- Settling Tanks
- Lime Mixing Tanks
- Measuring Channel
- Pipe Supports
- Effluent Lagoons
- Sludge Lagoons
- Supernatant Return Pipeline

B. Mechanical Works

- Coarse Screen
- Stainless Steel Pipeline
- Agitators
- Fiber glass Pipeline
- Flow Control Gates

C. Public Health Works

D. Fire Fighting Works

E. Storm Drainage System

F. Electrical System

G. Installation of Imported Equipment

- Automatic Screens
- Aerators
- Pumps

- Valves
- Settling Tank Equipment

V. Tannery solid waste disposal site (TSWDS) and its Approach Road comprising the following:

- Approach Road
- Bridge over Old Railway Track
- Solid Waste Disposal Site

The system also included procurement of Tractor-Trolleys for solid waste transportation and Bulldozer for compaction.

VI. Discharge system for Pre-Treated Effluent

- 1677 m long Out fall drain (open channel) 3 m wide, 1.2 to 1.5 m deep
- 1370 m long Sewer line 54" dia. R.C.C pipe line

VII. Procurement of the following:

- Water meters
- Vehicles
- Sludge Tanker
- Bulldozer
- Aerators
- Screens
- Pumps
- Valves
- Settling Tank Bridges

VII. Associated works

- Approach road to tannery clusters
- Storm water drain system
- Grit chambers at individual tanneries
- Covers/culverts on out fall & pucca drain

7. Construction Contracts

KTWMA entered into contracts with the contractors as under

i. For TSWDS with M/s Guarantee Engineers (Pvt.) Ltd. for a contract price of Rs 16,511,624. Contract was signed on 4-8-1999 and the contractor mobilized the same day.

ii. For CTEPTP with M/s Habib Rafiq (Pvt.) Ltd. for a contract price of Rs 125,225,231. Contract was signed on 31-8-1999 and the contractor mobilized on the next day i.e. 1st September 2000.

8. Manpower employed by Contractors

Both the contractors started the works enthusiastically with a large number of manpower. In Nov. 1999 the manpower employed by HRL was around 350 persons daily whereas GEL was averaging close to 90 persons daily. The average monthly input by HRL ranged to 115 and by GEL around 45 when period of Nov. 1999 to September 2001 is considered.

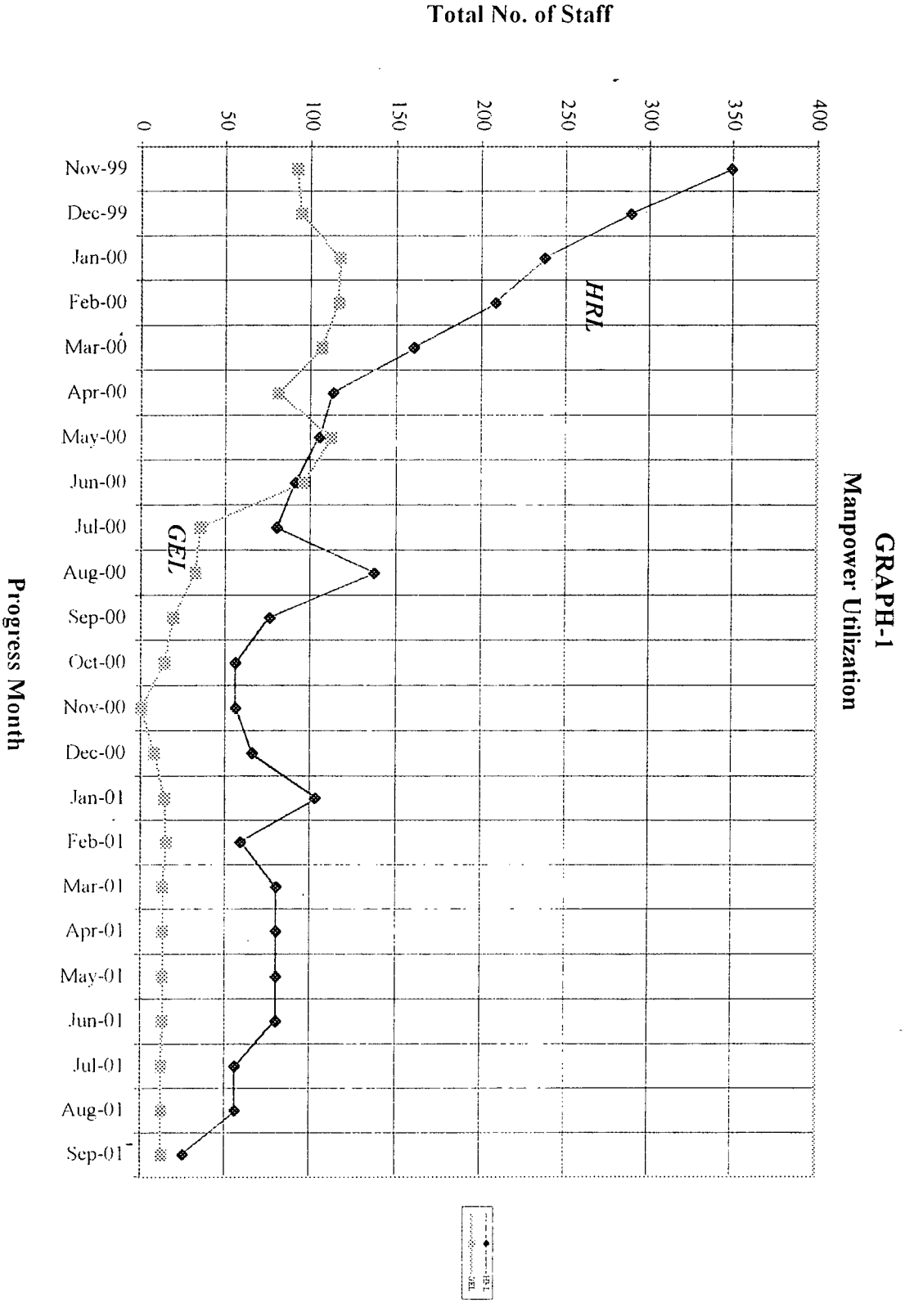
Here below is a table showing the average persons employed daily against each month.

Sr. No.	Month	Average staff employed during the month	
		Habib Rafiq (Pvt.) Ltd.	Guarantee Engineers (Pvt.) Ltd
1	November-99	349	92
2	December-99	289	94
3	January-00	237	117
4	February-00	208	116
5	March-00	160	106
6	April-00	113	81
7	May-00	105	112
8	June-00	91	96
9	July-00	80	35
10	August-00	137	32

11	September-00	76	19
12	October-00	56	14
13	November-00	56	0
14	December-00	66	8
15	January-01	103	14
16	February-01	59	15
17	March-01	80	13
18	April-01	80	13
19	May-01	80	13
20	June-01	80	13
21	July-01	56	12
22	August-01	56	12
23	September-01	25	12
24	**Total Man-months consumed**	2642	1039
25	**Average Man-months consumed**	114.87	45.17

Data for reports of March, April & May 2001 was submitted in the report of June 2001. No separate reports were submitted for March, April & May 2001

The graphical representation of the manpower input is given in Graph-1


GRAPH-1
Manpower Utilization
Total No. of Staff
Progress Month
HRL
GEL
0
50
100
150
200
250
300
350
400
Nov-99
Dec-99
Jan-00
Feb-00
Mar-00
Apr-00
May-00
Jun-00
Jul-00
Aug-00
Sep-00
Oct-00
Nov-00
Dec-00
Jan-01
Feb-01
Mar-01
Apr-01
May-01
Jun-01
Jul-01
Aug-01
Sep-01

9. Construction Supervision

For construction supervision. services of IN-Consult were hired under contract # 99/211/VK by UNIDO on 13th December 1999 whereas the consultants had already mobilized their staff at site on 5th November 1999. IN-Consult's services were initially hired up to 31st July 2000. In September 2000 the contract was extended for the period Sept. 2000 to Feb. 28. 2001 through Ammendment-1. In May 2001, the contract was further extended for another period i.e. May to Dec. 2001, through Amendment-2. Under this contract, IN-Consult's responsibility was limited to construction supervision of CTEPTP and TSWDS. Further. most of the other works had already been completed under KTWMAs' supervision

10. Compaction Tests

The major work on the civil works was earth related. The compaction of the filling was therefore examined very frequently. The tests performed and failed are listed in the table below. A total of 1515 tests on compaction of soil/clay were performed. This translates to an average of 66 tests performed per month despite the fact that during the last seven months of the project, no compaction test was performed as the earth related works had been completed.

Compaction Tests Performed

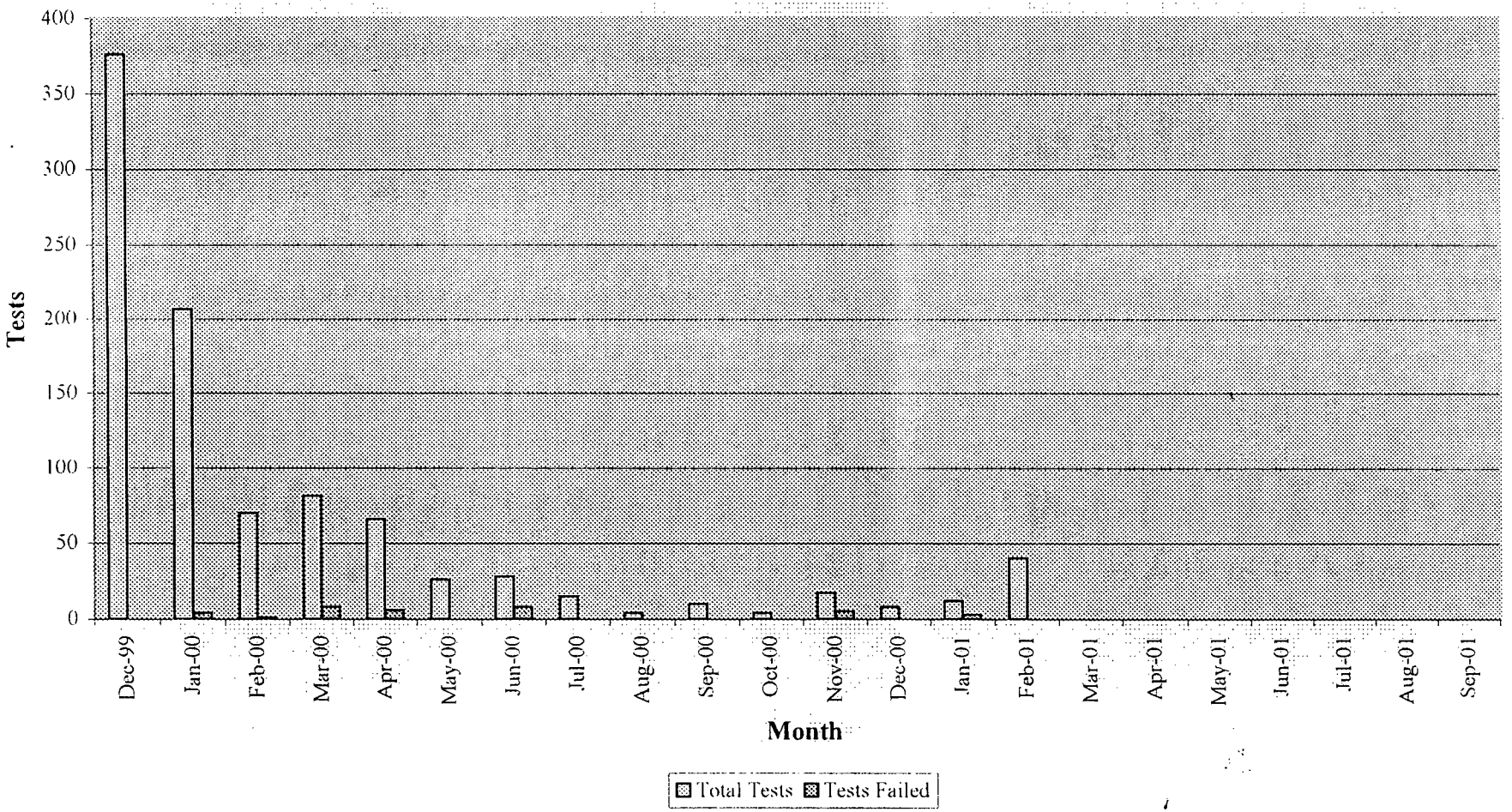
Sr. No.	Month	Habib Rafiq (Pvt.) Ltd.		Guarantee Engineers (Pvt.) Ltd	
		Total Compaction Tests Performed	Tests Failed	Total Compaction Tests Performed	Tests Failed
1	November-99	276	22	46	10
2	December-99	376	0	33	4
3	January-00	207	4	41	7
4	February-00	70	1	44	8
5	March-00	81	8	37	6
6	April-00	66	6	39	4
7	May-00	26	0	6	1

8	June-00	28	8	14	0
9	July-00	15	0	0	0
10	August-00	4	0	5	2
11	September-00	10	0	8	0
12	October-00	4	0	0	0
13	November-00	17	5	0	0
14	December-00	8	0	0	0
15	January-01	12	3	2	0
16	February-01	40	0	0	0
17	March-01	0	0	0	0
18	April-01	0	0	0	0
19	May-01	0	0	0	0
20	June-01	0	0	0	0
21	July-01	0	0	0	0
22	August-01	0	0	0	0
23	September-01	0	0	0	0
24	**Total Tests**	**1240**	**57**	**275**	**42**
25	**Average Tests per Month**	**5391**	**2.48**	**11.96**	**1.83**

The graphical representation of tests for both HRL and GEL is given in Graph-2 & 3 respectively.

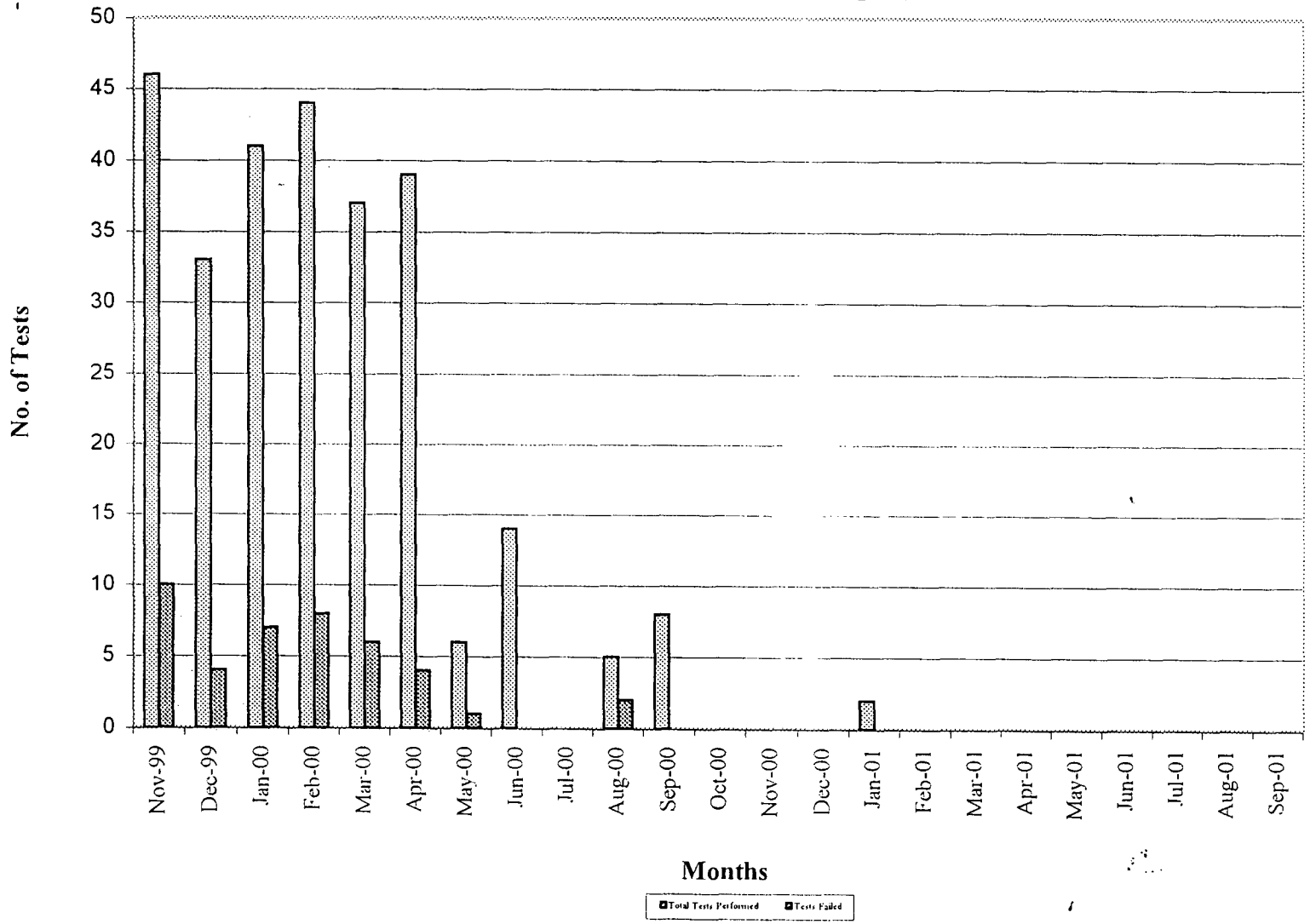
GRAPH-2

COMPACTION TEST FOR HRL



GRAPH-3

TESTS PERFORMED BY GEL



11. Project Personnel

i. UNDP

During construction period, most of the time UNDP was represented by Mr. Klause Tyrkko (Programme Manager)

ii. UNIDO:

Dr. Robert G. Guman (Country Representative) very actively participated during the execution period. He was assisted by Mr. Ibrahim Saeed .

iii. KTWMA

During the construction period Kasur Tannery Waste Management Agency KTWMA was headed by Dr. A.R. Siddiqi & upon his departure on August 15, 2001, the Deputy Project Manager, Mr. M. Saleem Malik took over the charge.

During the construction period, following technical key personnel had represented KTWMA for either throughout or part of the construction period:

1. Dr. A.R. Siddiqi
2. Mr. M. Aslam Bhutta
3. Mr. M. Saleem Malik
4. Mr. Irfan Saeed Alrai
5. Mr. Javed Parwaz
6. Rana Ijaz Ahmad
7. Mr. Saif ullah Amin
8. Mr. Ata Muhammad

iv. IN Consult (Pvt.) Ltd.

During construction supervision following key personnel were deputed at site:

1. Mr. Ijaz-ul-Haq Toor
2. Mr. Naeem Javed
3. Ch. Abdul Majeed
4. Mr. A.R. Chishti
5. Mr. Najam Tamim
6. Mr. Muhammad Nawaz
7. Mr. M. Shamroze Malik
8. Mr. Muhammad Abdullah
9. Mr. Muzammil Iqbal
10. Mr. Mahmood Bhatti
11. Qazi Basharat Ahmad
12. Mirza Maqbool Ahmed

v. The Contractors

a. For plant, the contract was awarded to M/s Habib Rafiq (Pvt.) Ltd. Construction Manager Mr. Munawar Khokhar represented the contractor for most of the construction period.

b. For approach road & solid waste disposal site the contract was awarded to M/s Guarantee Engineers (Pvt.) Ltd. The contractor was represented by Mr. Tariq. Mahmood

c. For small works various contacts were awarded to contractors.

12. Project Review Meetings

The project was continuously monitored by the project authorities. The periodic meetings were held for review of the progress and to resolve the issues. Overall 27 progress review meetings were held averaging @ 1.2 meetings per month. The table below shows the no. and dates of the meetings.

Progress Review Meetings

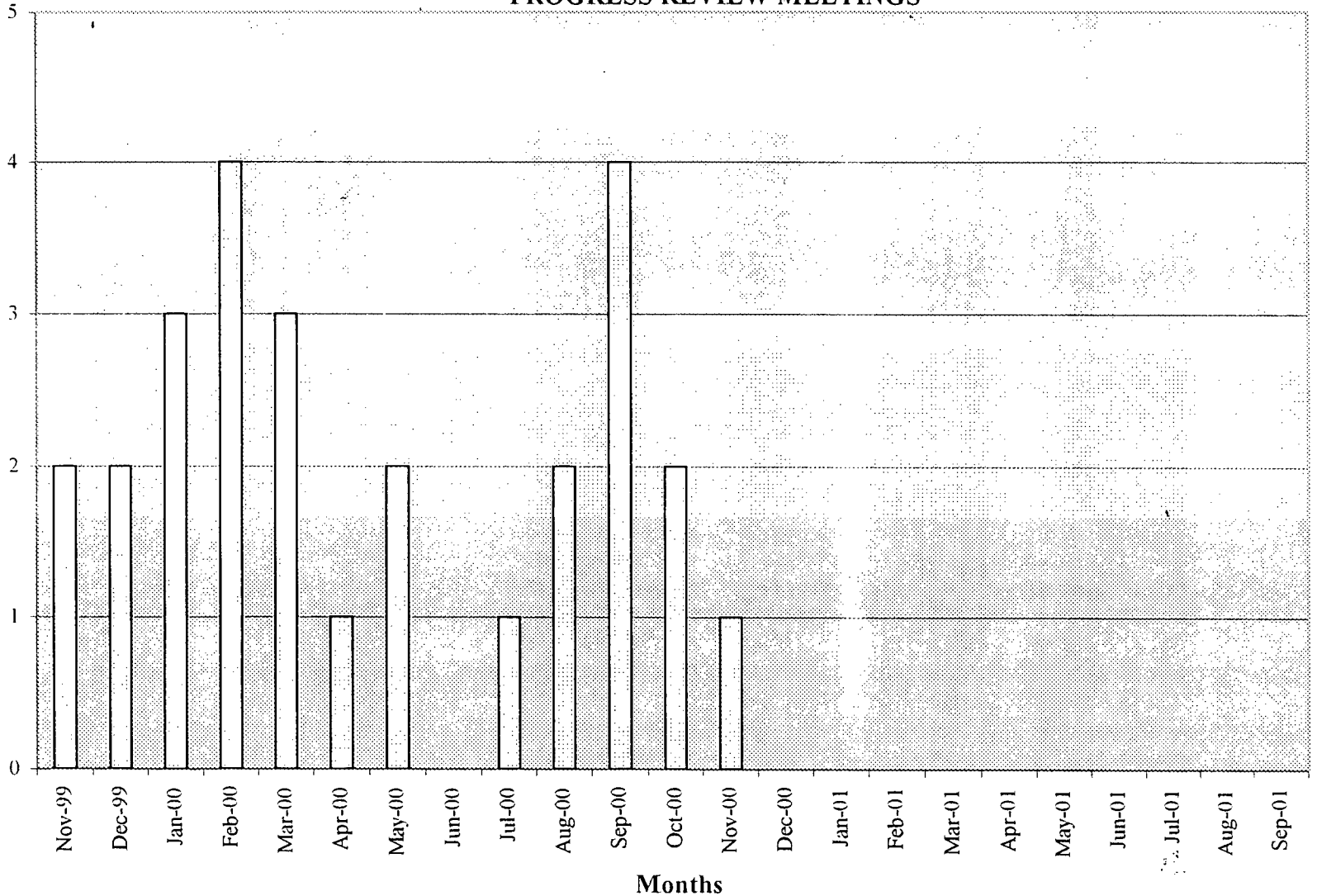
Sr. No.	Month	Progress Review Meetings	
		No.	Dates
1	November-99	2	5th & 20th
2	December-99	2	4th & 18th
3	January-00	3	3rd, 15th & 29th
4	February-00	4	7th ,9th, 21st & 28th
5	March-00	3	7th,15th & 28th
6	April-00	1	24th
7	May-00	2	6th & 24th
8	June-00	0	-
9	July-00	1	22nd
10	August-00	2	19th & 29th

11	September-00	4	4th, 9th, 16th &23rd
12	October-00	2	7th & 19th
13	November-00	1	16th
14	December-00	0	-
15	January-01	0	-
16	February-01	0	-
17	March-01	0	-
18	April-01	0	-
19	May-01	0	-
20	June-01	0	-
21	July-01	0	-
22	August-01	0	-
23	September-01	0	-
24	**Total Meetings Held**	27	
25	**Average Meetings per month**	1.17	

Graphical presentation of the progress review meetings is given in Graph-4.

GRAPH-4

PROGRESS REVIEW MEETINGS



13. Additional and Revised Drawings

The construction drawings were followed strictly for construction of the plant however some drawings were reviewed and revised to suit the situation at site. At certain locations new drawings were also required to be prepared. The table and graph below show the issue of revised/Additional drawings every month.

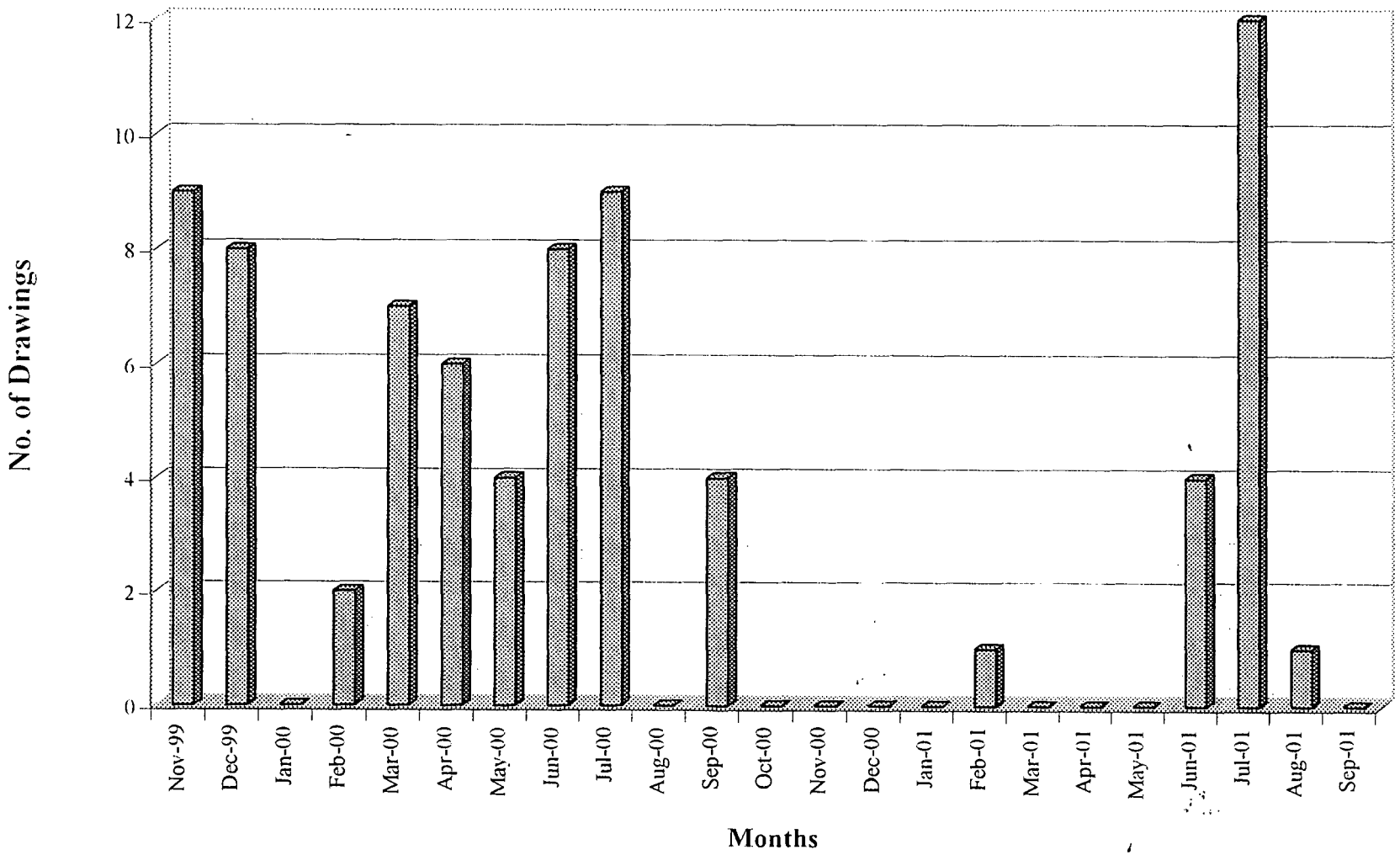
Drawings

Sr. No.	Month	No. of Additional/ Revised Drawings Issued
1	November-99	9
2	December-99	8
3	January-00	0
4	February-00	2
5	March-00	7
6	April-00	6
7	May-00	4
8	June-00	8
9	July-00	9
10	August-00	0
11	September-00	4
12	October-00	0
13	November-00	0
14	December-00	0
15	January-01	0
16	February-01	1
17	March-01	0
18	April-01	0
19	May-01	0
20	June-01	4
21	July-01	12
22	August-01	1
23	September-01	0
24	**Total Drawings Issued**	75
25	**Average Drawings issued per month**	3.26

The graphical presentation can be seen in Graph-5.

GRAPH-5

ADDITIONAL/REVISED DRAWINGS



14. Foreign equipment

UNDIO, in addition to technical assistance, provided the imported equipment for installation on the plant. The list of equipment is as under;

1. Automatic screen Spirac (Australia)–2 No.
2. Aerators Aspiro (Australia)-19 No. (Sixteen installed –3 spares)
3. Valves various sizes (Amri-France) 23 No.
4. Submersible pumps (ABS-Germany)-9No (7 installed 2 spares)
5. Settling tank bridge (Neühold-Austria) 2 sets.

This equipment (except valves) was installed by Habib Rafiq (Pvt.) Ltd. under the technical supervision form the representatives of;

- Spirac (for screens)
- Aspiro (for Aerator)
- Neühold (for Settling Tank Equipment)

Valves were installed by KSB (local representatives of Amri France) whereas no assistance was provided by ABS Pumpen for installation.

15. Financial-Verification of Invoices

The work for CTEPTP was awarded to M/s Habib Rafiq (Pvt.) Ltd. for a contract price of Rs.125,225,231, The amount certified for payment against invoices of the work for CTEPTP up to September 2001, were Rs.118.88 million Rupees.

The work for TSWDS was awarded to M/s Guarantee Engineers (Pvt.) Ltd. for a contract price of Rs.16,511,624. The amount certified for payment against invoices of the work for TSWDS up to September 2001, were Rs.13.85 million.

The bills were submitted almost every month and their verification was done by the consultants. The table and graph below provide the information of bills and amounts verified by the consultants.

Amounts Verified for Payments

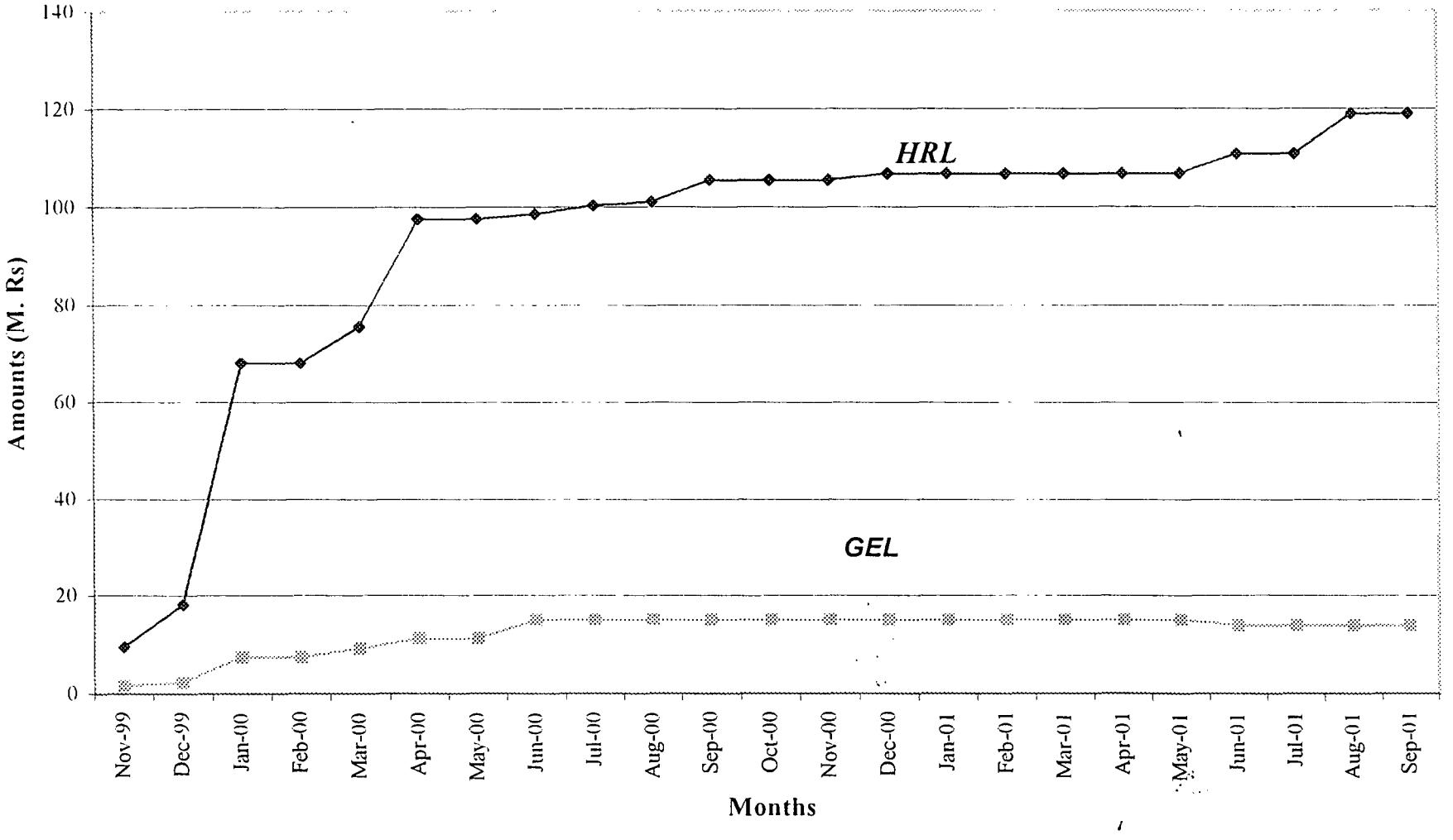
Sr. No.	Month	Cumulative Amounts (M. Rs.)	
		Habib Rafiq (Pvt.) Ltd.	Guarantee Engineers (Pvt.) Ltd.
1	November-99	9.46	1.52
2	December-99	18.13	2.31
3	January-00	68.06	7.38
4	February-00	68.06	7.38
5	March-00	75.51	9.08
6	April-00	97.56	11.17
7	May-00	97.56	11.17
8	June-00	98.52	14.98
9	July-00	100.18	14.98
10	August-00	100.95	14.98
11	September-00	105.47	14.98
12	October-00	105.47	14.98
13	November-00	105.47	14.98
14	December-00	106.77	14.98
15	January-01	106.77	14.98
16	February-01	106.77	14.98
17	March-01	106.77	14.98
18	April-01	106.77	14.98
19	May-01	106.77	14.98
20	June-01	110.72	13.86
21	July-01	110.72	13.86
22	August-01	118.88	13.86
23	September-01	118.88	13.86

Note:

Amounts corrected for GEL in June 2001 therefore the figures have been reduced

The graphical presentation of certified amounts can also be seen in Graph-6

GRAPH-6
CUMMULATIVE PAYMENTS CERTIFIED



16. Completion of Project

Both parts of the contract were initially scheduled for completion with in a rather over ambitious target of 31-12-1999. However due to various reasons, the project was delayed and substantial completion was achieved as under:

i.	For Approach Road & TSWDS:	17th September 2000.
	Contractor:	Guarantee Engineers (Pvt.) Ltd.
ii.	For CTEPTP:	31st August 2001
	Contractor:	Habib Rafiq (Pvt.) Ltd

17. Deliverable/Reports

After its engagement in Nov. 1999, IN-Consult submitted monthly progress reports for each month of progress except for April-May 2001, which were covered under the monthly report of June 2001.

18. O & M Manual

The O&M Manual for the CTEPTP has been prepared and available with KTWMA and can be consulted as and when required.

19. Milestones

During Design and Construction the milestone are as under.

- Appointment of IN-Consult for preparation of construction documentation (contract #98/VK/215) on 31st December 1998.
- Finalization of construction document July 31, 1999.
- Award of contract for Approach Road & TSWDS to M/s Guarantee Engineers (Pvt.) Ltd. 4-08-1999.
- Award of contract for CTEPTP to Habib Rafiq (Pvt.) Ltd. 31-08-1999
- Mobilization of GEL on 4th August 1999
- Mobilization of HRL on 01st September 1999
- Issue date of purchase order for imported equipment were as under.

▫ Automatic Screens	: 22nd December 1999
▫ Aerators	: 17th April 2000
▫ Submersible Pumps	: 17th December 1999
▫ Settling Tank Bridge	: 22nd December 1999
▫ Valves	: 03rd April 2000

- Arrival of Equipment at site

  - Screen : 22nd December 2000
  - Aerators : 08th November 2000
  - Pumps : 16th October 2000
  - Valves : 29th July 2000
  - Settling Tank Equipment: 07th September 2000

- Partial Commission started on

  - Screen : 18th April 2001
  - Aerators : 25th May 2001
  - Valves : 07th June 2001
  - Bridge : 12th June 2001
  - Pumps : 07th June 2001

- Test run of the plant equipment :15th June 2001
- Trial operation of plant started :25th September 2001

20. Project Visitors

The project, being a long outstanding environmental issue for Kasur inhabitants, was target of the attention of many people. It therefore attracted masses, political figures, as well as the stakeholder's representative.

Below is the list which indicates the dates when the plant was visited by the dignitaries. The list does not include many more unplanned visits. Overall the plant was visited 62 times by the following visitors.

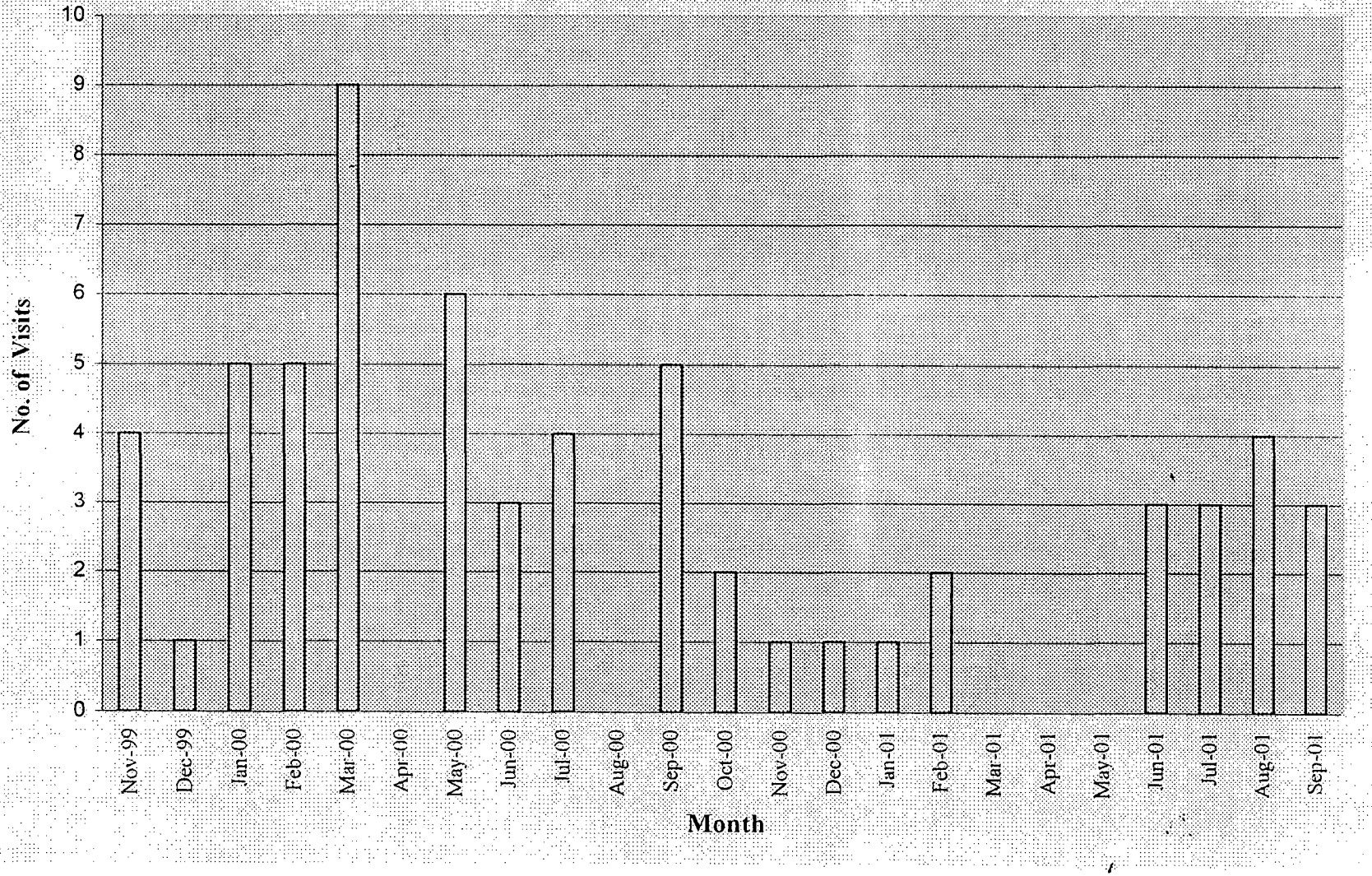
List of Visitors

25.11.1999	Delegation of NIPA
26.11.1999	Delegation of Civil Secretariat Staff College
29.11.1999	Mr. Ibrahim Saeed (UNIDO)
30.11.1999	Army Engineers Projects Monitoring Team
28.12.1999	Commanding Officer Army Engineers
03.01.2000	Secretary EPD
05.01.2000	Additional Secretary EPD
14.01.2000	Additional Secretary EPD
- 18.01.2000	Provincial Minister for Environment

20.01.2000	Dr. R. Gumen UNIDO Country Director
10.02.2000	Teachers and Students of Kasur Public School
11.02.2000	Deputy Secretary EPD
11.02.2000	Brig. Jehanzeb with NPD KTWMA (DC Kasur)
22.02.2000	PD (DC Kasur) along with ADC (G) & AC (UT)
25.02.2000	Commissioner Lahore NPD KTWMA (DC Kasur)
03.03.2000	Additional Secretary EPD, Punjab
03.03.2000	Brig. Rabbani & Col. Saleem, Army Monitoring Cell
09.03.2000	Additional Secretary EPD, Punjab
14.03.2000	A delegation of Press – Radio & TV
20.03.2000	Col. Tariq, ADC (G) & AC (UT)
21.03.2000	G.O.C. Lt. General Mohammad Javed
22.03.2000	A Delegation of U.N.
27.03.2000	Dr. Gumen & Ibrahim Saeed – UNIDO
31.03.2000	C.O. Lahore Garrison
01.05.2000	Brigade Commander along with D.C. Kasur.
08.05.2000	Governor's Inspection Team.
09.05.2000	Sialkot Tannery representatives
18.05.2000	Delegation of tanners from Karachi & Lahore along with D.G. EPB & Dr. Gumen UNIDO
20.05. 2000	Governor's inspection team
24.05.2000	Mr. Ibrahim Saeed UNIDO
06.06.2000	Dr. Schmel and Dr. Gumen with Mr. Ibrahim Saeed (UNIDO).
20.06.2000	A delegation of SDPI.
24.06.2000	Mr. Aftab Islam Agha Governor's Inspection Team.
01.07.2000	MD KTWMA/DC Kasur
04.07.2000	Secretary Industries.
11.07.2000	UNIDO Country Representative
22.07.2000	Federal Secretary EPD

08.09.2000	UNIDO Country Representative
19.09.2000	Col. Tariq Army Monitoring Team
20.09.2000	Punjab University Students Delegation
26.09.2000	Maj. Anjum & Capt. Ehsan, Army Monitoring Team
28.09.2000	Brig. Ashraf, Army Monitoring Team
10.10.2000	Doctors Delegation from Munir Hospital Kasur
27.10.2000	Federal Minister for Environment, Mr. Omar Asghar Khan
08.11.2000	GOC Mr. Ahmad Saleem Mela and DC Kasur
21.12.2000	Geo-membrane Experts Committee members
20.01.2001	Secretary EPD, Punjab,
10.02.2001	Students (boys) from Kasur Public School, Kasur
12.02.2001	Students (girls) from Kasur Public School, Kasur
17.06.2001	Secretary EPD, Director EPD
15.06. 2001	Representatives of Tanner's Associations, Sec. EPD, Chief P&D, Army Monitoring Team, Sec. Industries Punjab and many others.
20.06.2001	Mr. Onder Yucer UNDP
03.07.2001	Mr. Michael Alloy, UNIDO
04.07.2001	Governor Inspection Team, Mr. Alloy
21.07.2001	Governor Punjab with other dignitaries
02.08.2001	Delegation from Nursing School of DHQ, Kasur
09.08.2001	NESPAK Team
20.08.2001	District Coordination Officer, Kasur
21.08.2001	UNIDO Country Director, from Islamabad
01.09.2001	District Coordination Officer Kasur/MD KTWMA
13.09.2001	Mr. Jim Freeman (UNDP, New York), Ms. Joyce Yu (UNDP, Malaysia), Mr. Ahmad Naqvi (UNDP), Mr. Javed Akram (UNDP), Dr. Robert Gumen (UNIDO Country Director), DCO Kasur
25.09.2001	Mr. Tariq Hameed, Environment Minister Govt. of Punjab, District & Tehsil Nazims, Secretary EPD, DCO Kasur and other dignitaries.

GRAPH-7
PLANT VISITS



The number of visits is tabulated as under:

The Plant Visits

Sr. No.	Month	No. the Plant was Visited
1	November-99	4
2	December-99	1
3	January-00	5
4	February-00	5
5	March-00	9
6	April-00	0
7	May-00	6
8	June-00	3
9	July-00	4
10	August-00	0
11	September-00	5
12	October-00	2
13	November-00	1
14	December-00	1
15	January-01	1
16	February-01	2
17	March-01	0
18	April-01	0
19	May-01	0
20	June-01	3
21	July-01	3
22	August-01	4
23	September-01	3
24	**Total Number of Plant visits**	62
25	**Average Visits per month**	2.7

Note: Data for visits during March, April & May 2001 is not included in the report.

The graphical presentation of the visits by various delegations/visitors is provided in Graph-7

21. Bottlenecks

The project during its implementation has seen many ups & downs. It being a political cum environmental project had involved many personalities. In addition to the technical personals, many political figures were also involved like Provincial Governor & Chief Minister, Federal & Provincial Minister, MNA's, MPA's, Nazims, Army officers like Corp Commander, Brigadiers, Colonels, Army Monitoring Team, etc. and Beaurocrates like chief of P & D Secretary, Deputy Commissioners etc.

It also attracted the attention of representatives of stakeholders like GOP, Govt. of Punjab, Export Promotion Bureau and Tanner's Associations. With the involvement of many agencies, problems always aggravate and the project also faced this dilema. It was interesting to note that after almost 90% completion of civil works, questions were raised by some quarters about feasibility of process design. The project also suffered setback due to poor management by the project manager. Involvement of many parties invited certain problems due to variance in their respective internal procedures, which were usually not in line with the others. Selection of equipment and variance with the specifications also caused delay. It was probably due to shorter time for evaluation of the equipment.

In short, the project went through the following major bottlenecks in addition to general construction related problems.

- Delay in decision with respect to the selection of consultants, which made some part of project unattended by IN-Consult.
- Over ambitious target for completion of the project which triggered procurement in short time resulting in selection from a little verity for various items.
- Frequent changes in the project management team i.e. resignation of Deputy Project Manager, Senior Engineer etc.
- Smaller area for lagoons forced for a steeper slope of dikes and clay over geomembrane slipped. Although technically it has not caused any problem but it damages the beauty of the project.
- During last days of the project completion, war erupted in the region, which made it difficult for foreign experts to visit the project area and give last minute advises on touch ups.
- Storage area for imported equipment. A storage area must be allocated prior to arrival of imported equipment

22. Recommendations for Similar Future Projects

As the project was commissioned successfully it is recommended that it should be replicated in other tanning industry areas of Pakistan. However to save other projects from facing problems, the following is recommended

i. The selection of Project Manager should be done very carefully. The PM should have experience in handling similar project.

ii. The Process & Design of such projects should be got approved by relevant department to save it from future problems.

iii. The appointment of supervisory consultants should be done in time.

iv. The sustainability check of the project should be studied prior to its initiation. In Kasur case, it was ambiguous as to how the O & M expenditures will be met.

v. The required staff for operation should be highlighted before construction implementation.

vi. The O & M budget should be included in PC-1.

vii. Procurement of Workshop Equipment should be done simultaneously.

viii. Project authorities should be involved in technical decisions

ix. Sequence of the activities for the project should be made, agreed upon and then followed up by UNIDO's local office. For bigger projects, UNIDO must engage some person for co-ordination at Pakistan level on behalf of UNIDO.

x. Residences of staff should also be included for other similar projects or alternatively transportation to be arranged.

xi. UNIDO's attention should be invited towards initiation of municipal sewerage treatment plant, as the Pre-Treated Effluent does not fully meet the requirements of NEQS.

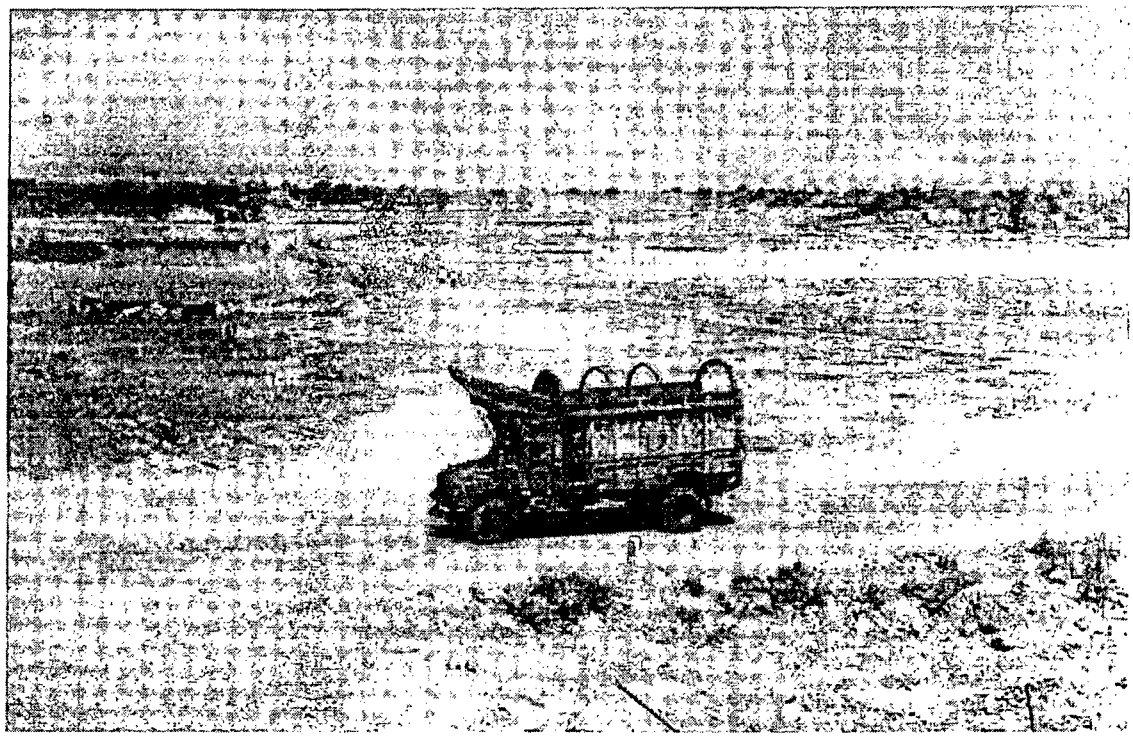
xii. UNIDO should launch a research to identify the type of plants, which grow comfortable in the vicinity of such plants.

xiii. The project must be monitored by UNIDO for at least 5-10 years and provide advise as & when required by the authorities operating the plant.

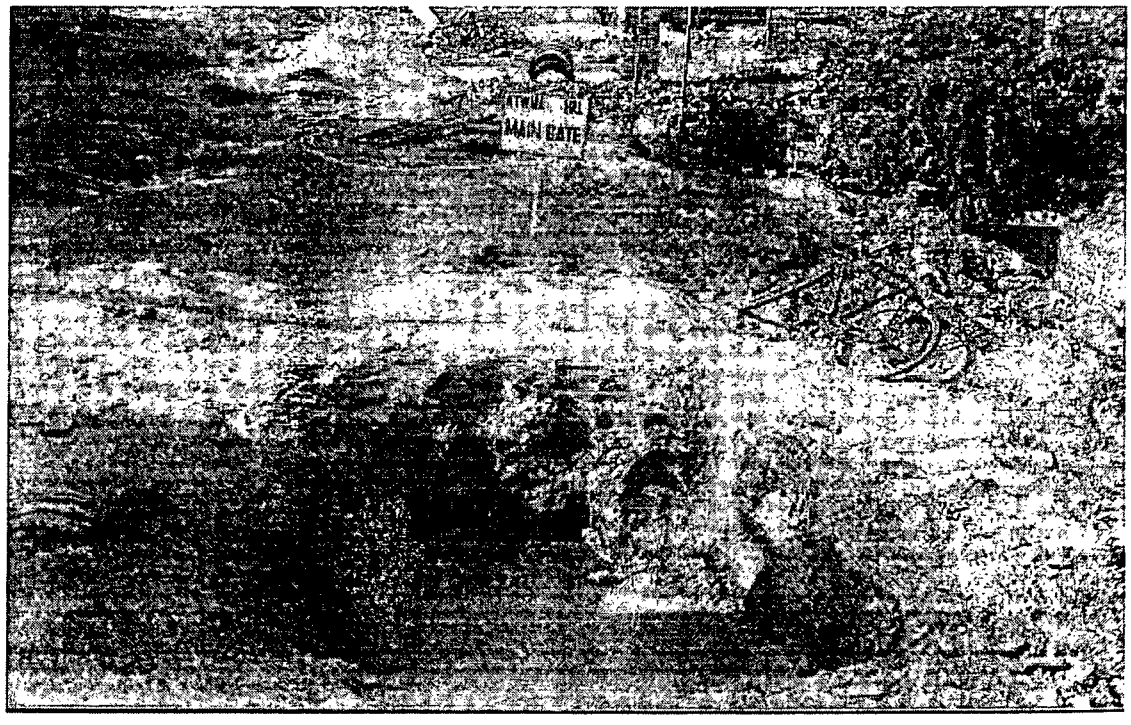
xiv. UNIDO should think over establishing a desk either at its Islamabad office or at CTEPTP Kasur for providing technical assistance to tanners in Pakistan in general and in Kasur in particularly.

23. Gallery

On the following pages, some pictures are provided. These pictures were taken during the construction phase.



1 – AREA PRIOR TO START OF PROEJCT

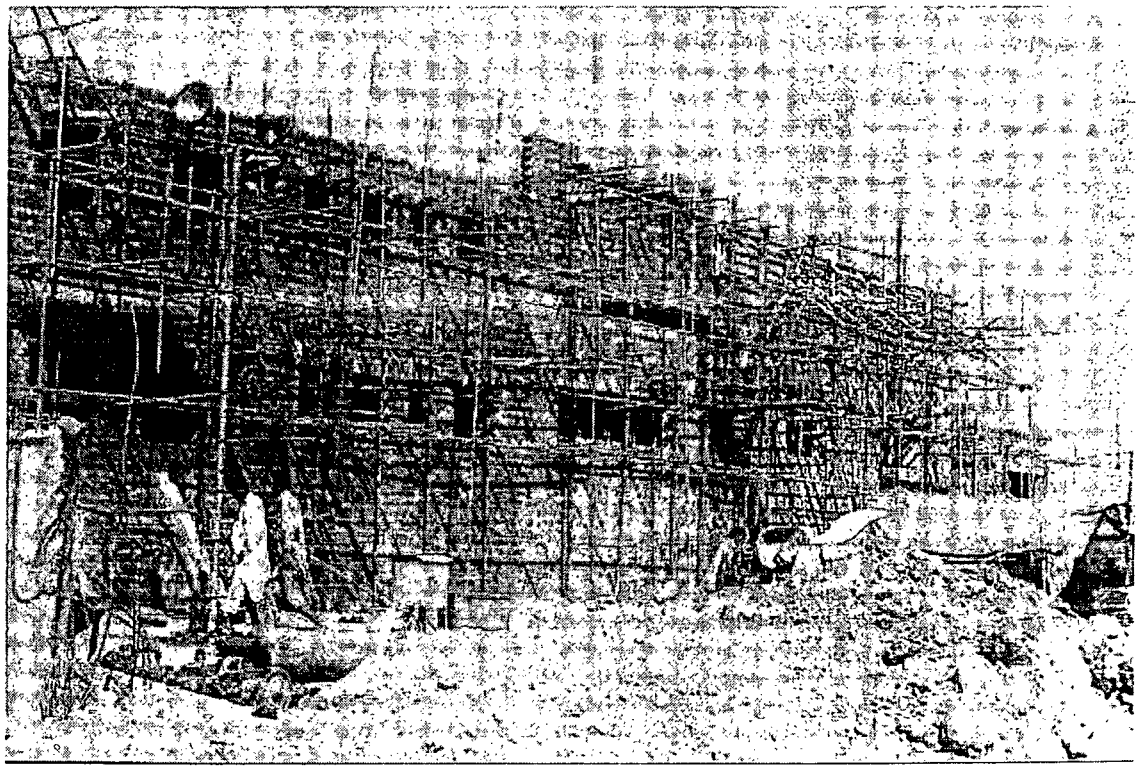


2 - EXCAVATION FOR MAIN GATE & CONTROL BUILDING

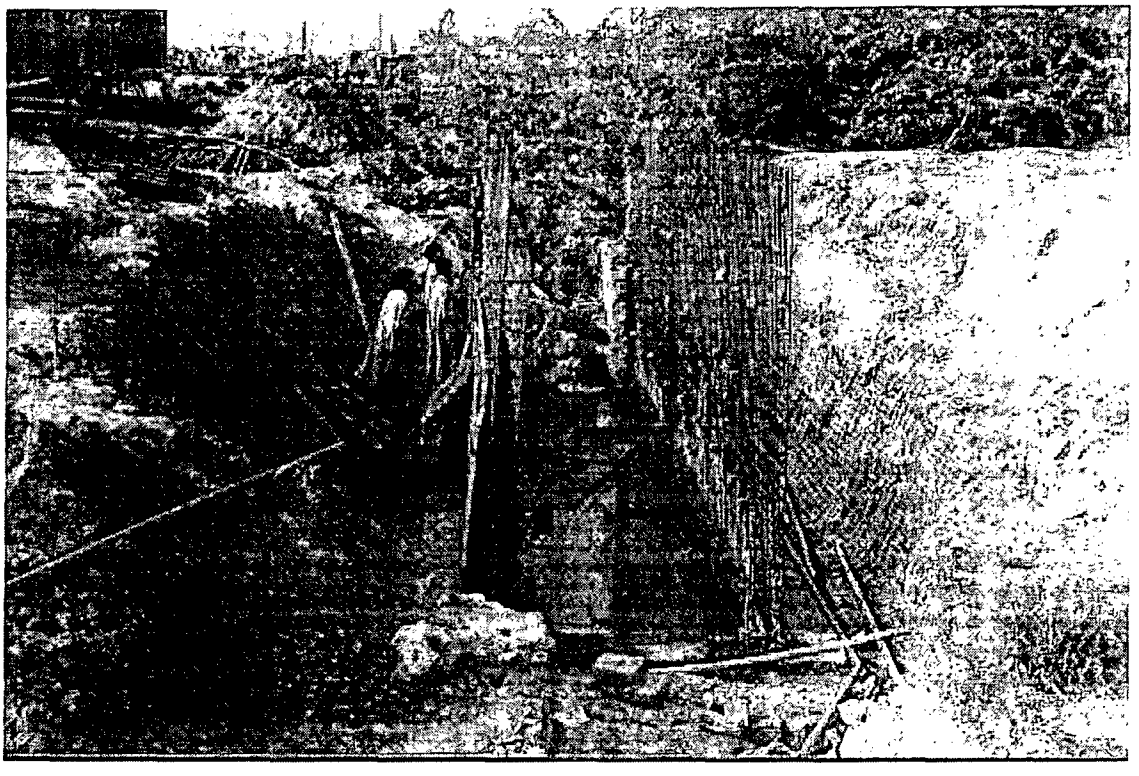
3 - EXCAVATION UNDERWAY FOR LAGOONS

4 - INLET SUPPLY CHANNEL UNDER CONSTRUCITON

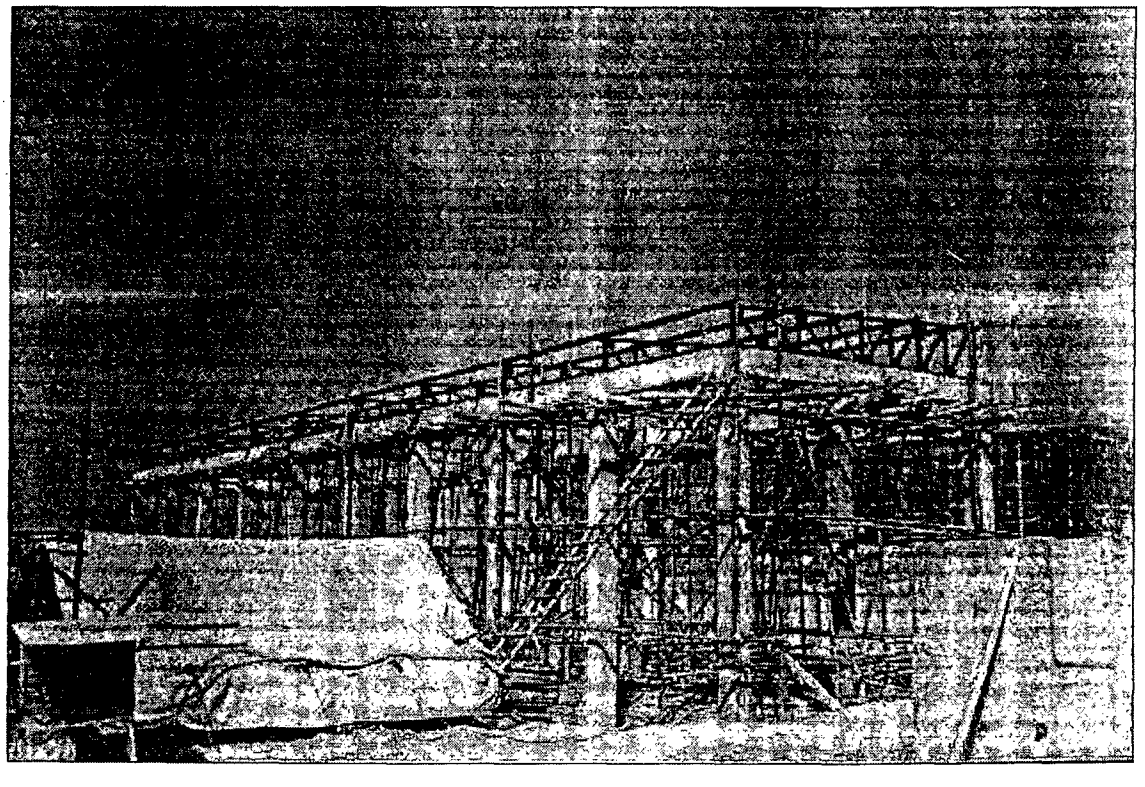
5 – FRONT AREA FILL-UP



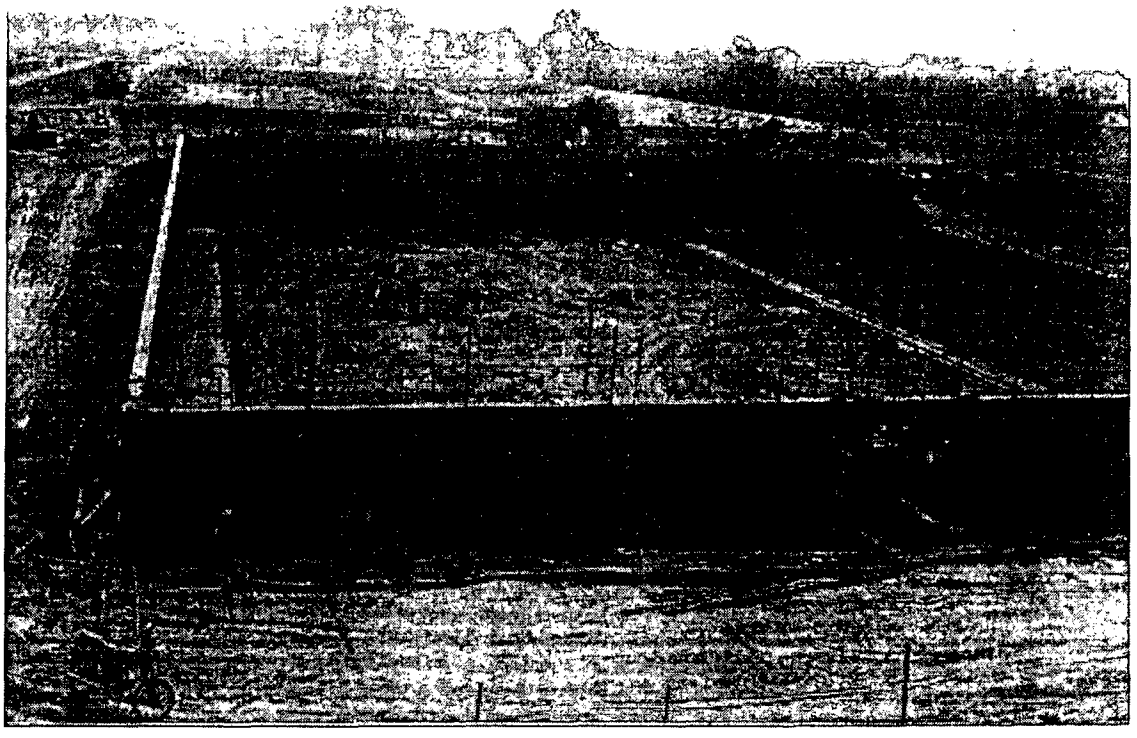
6 – CONTROL BUILDING UNDER CONSTRUCTION



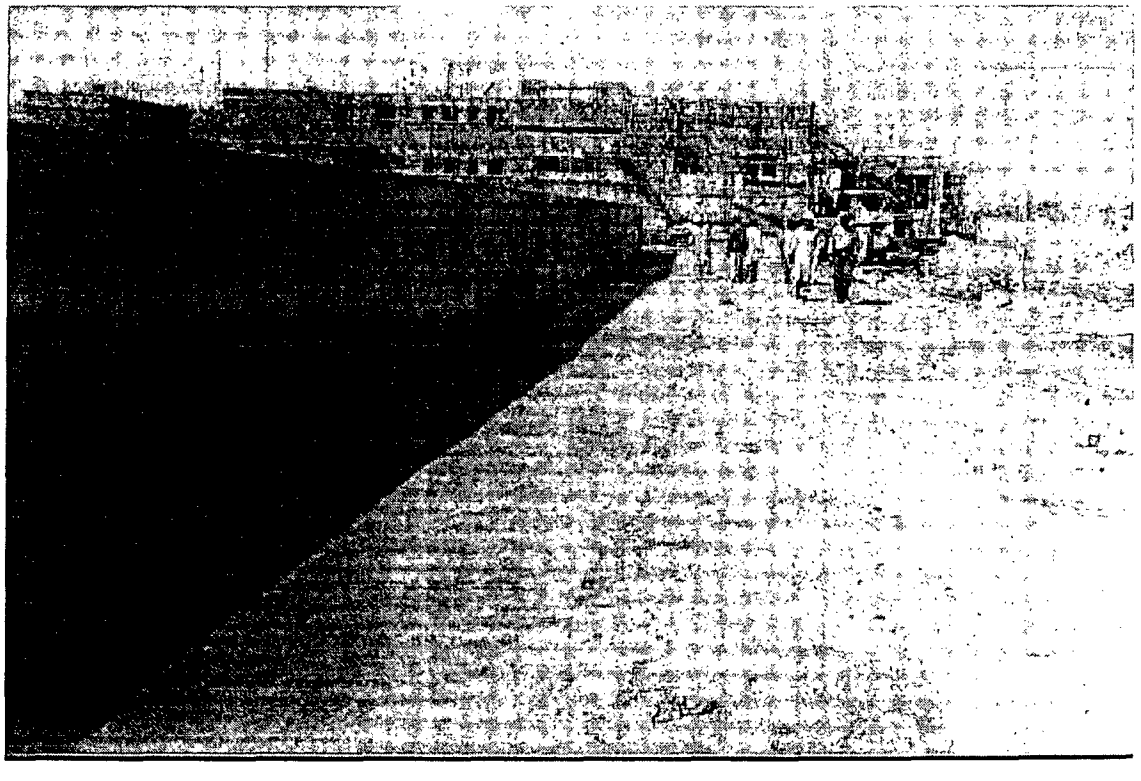
7 – SUPPLY CHANNEL STEEL WORKS



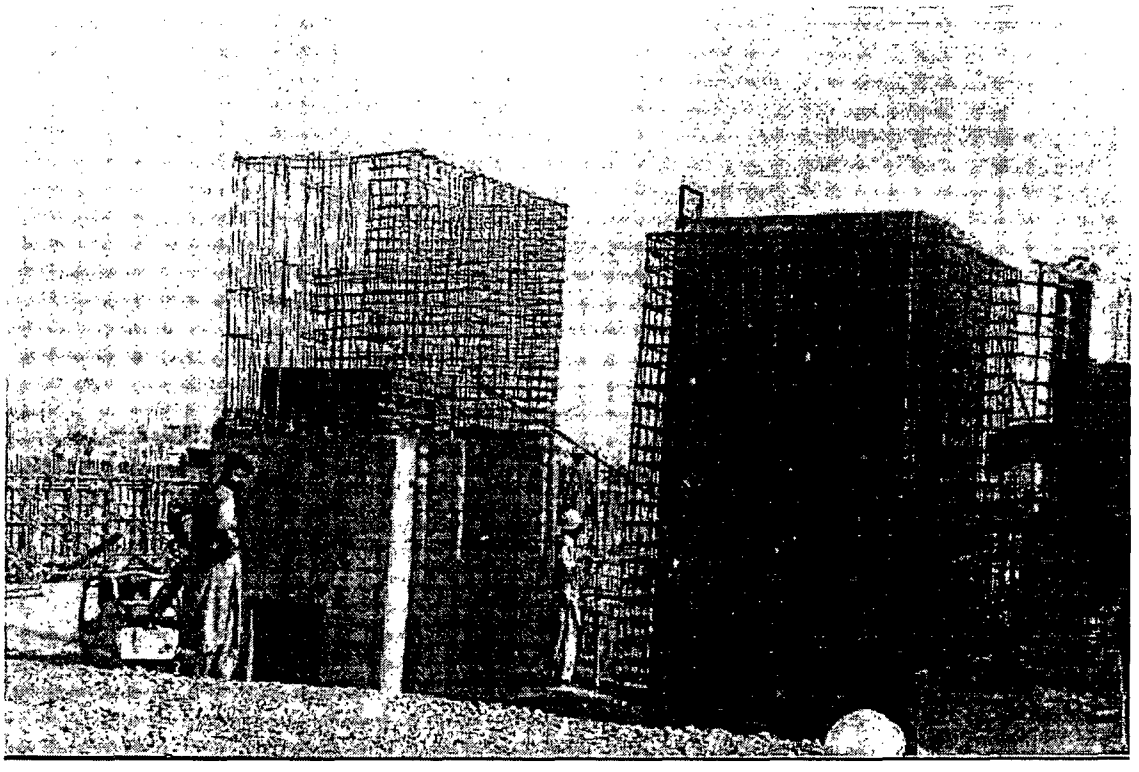
8 – PARKING SHED STEEL WORKS



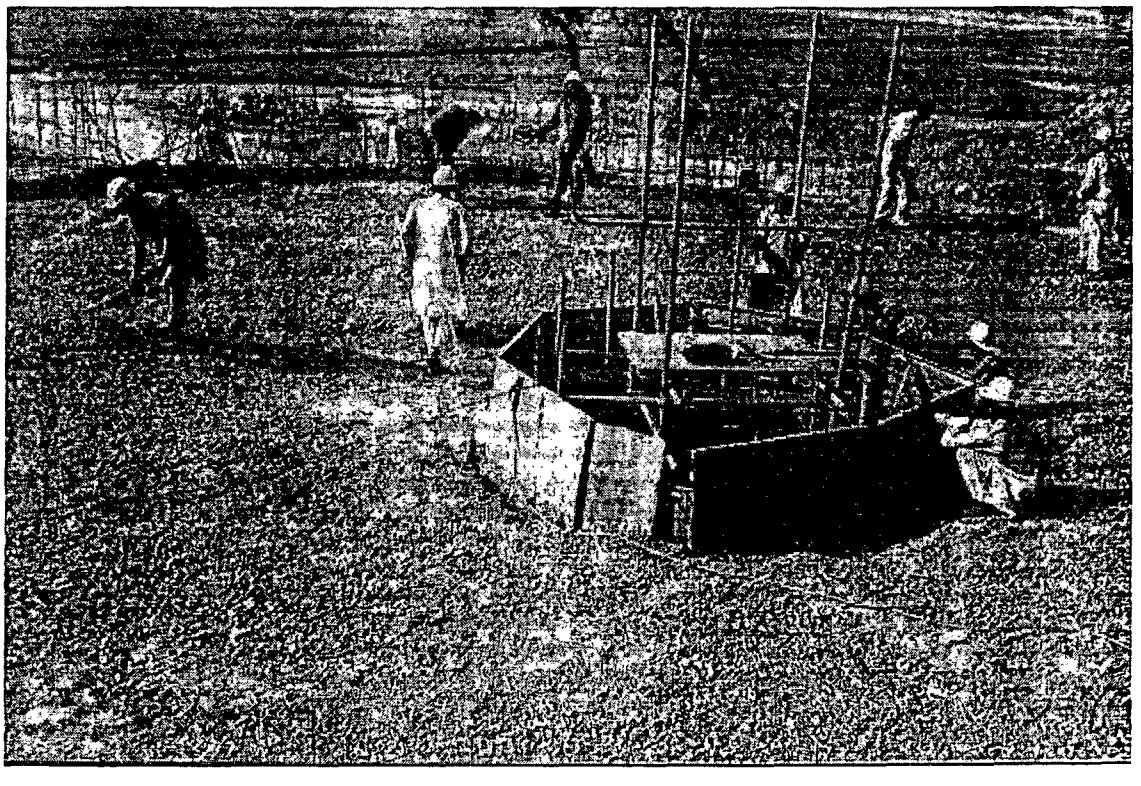
9 – CONSTRUCTION OF EQUALIZATION TANKS



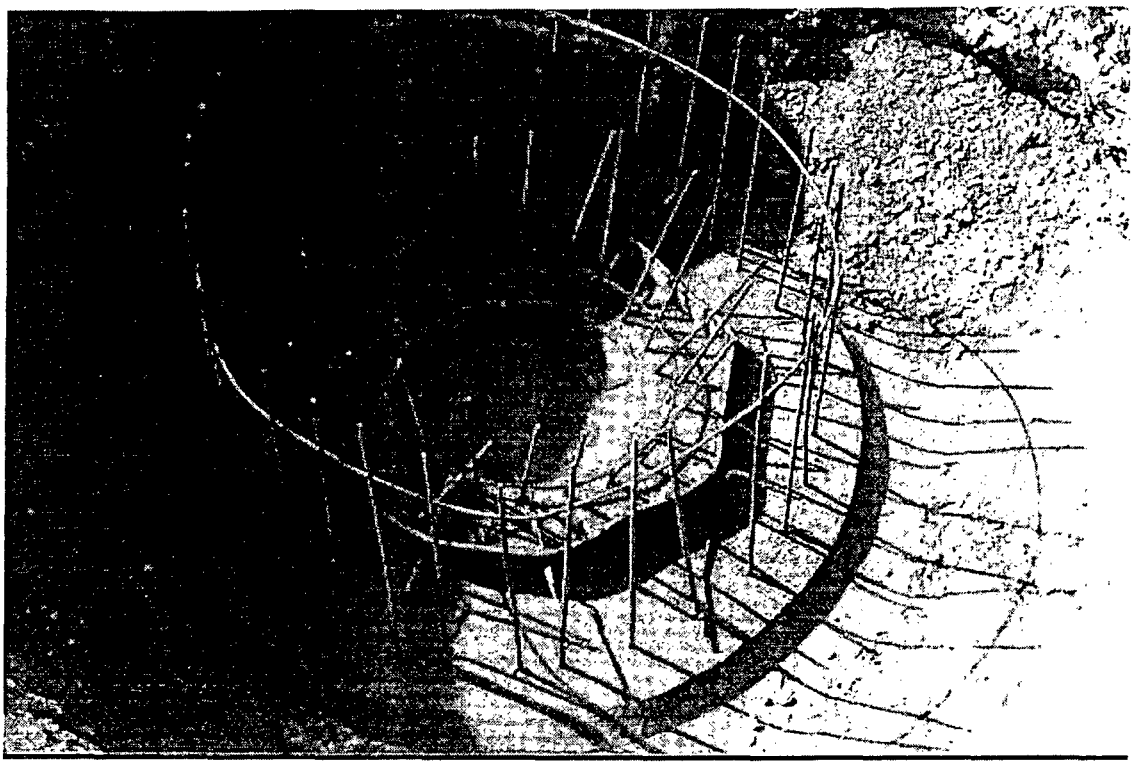
10 – EQUALIZATION TANK'S OUTER WALL BEFORE AREA BACKFILLING



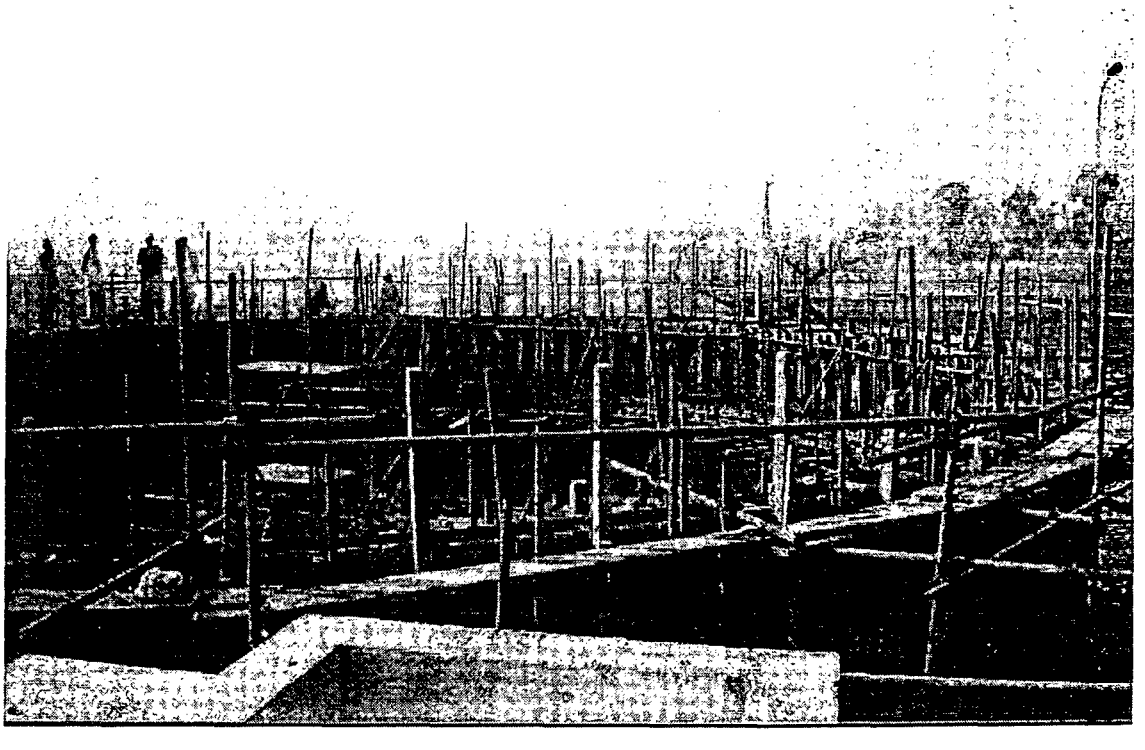
11 – EFFLUENT DELIVERY TANK UNDER CONSTRUCITON



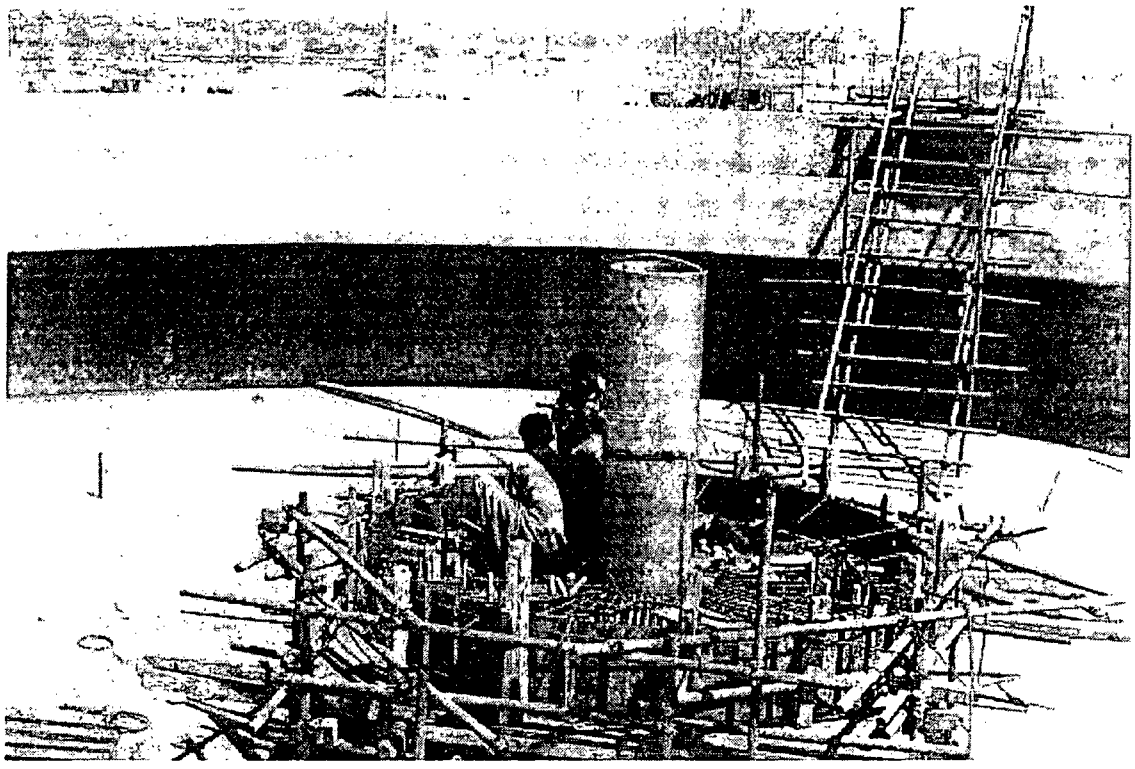
12- SETTLING TANK CENTRAL COLUMN FORM WORK



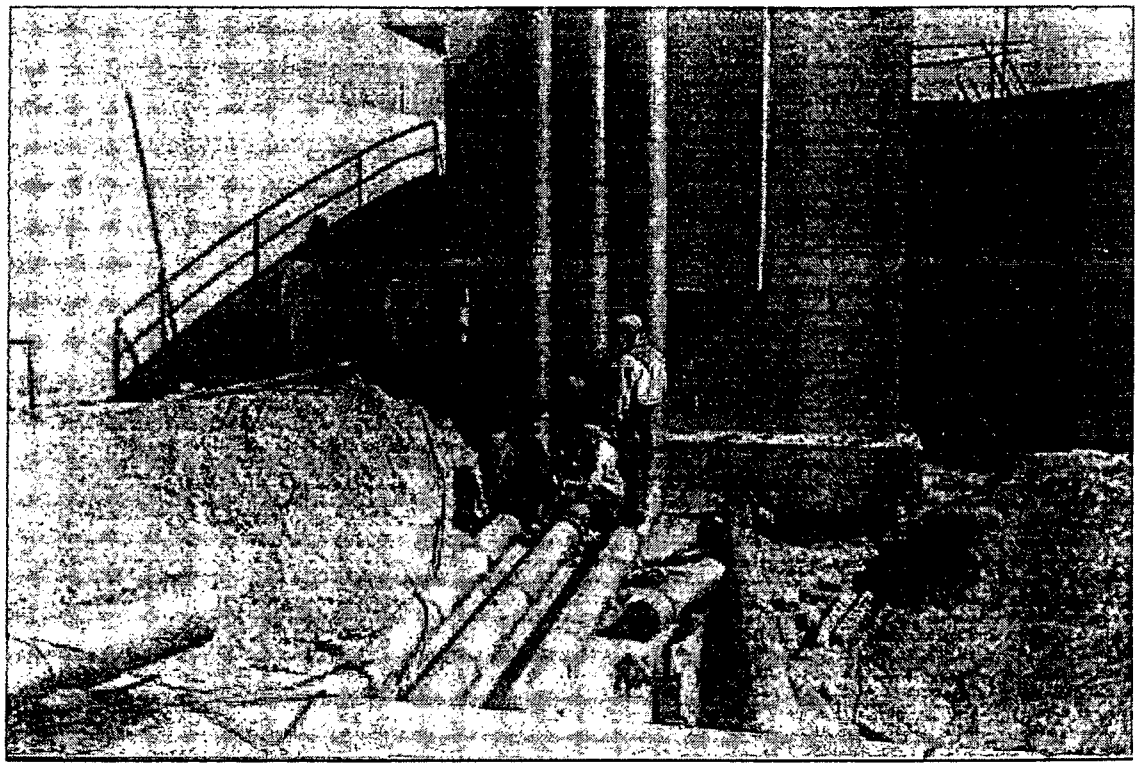
13 – SETTLING TANKS CENTER COLUMN FOUNDATION
UNDER CONSTRUCTION



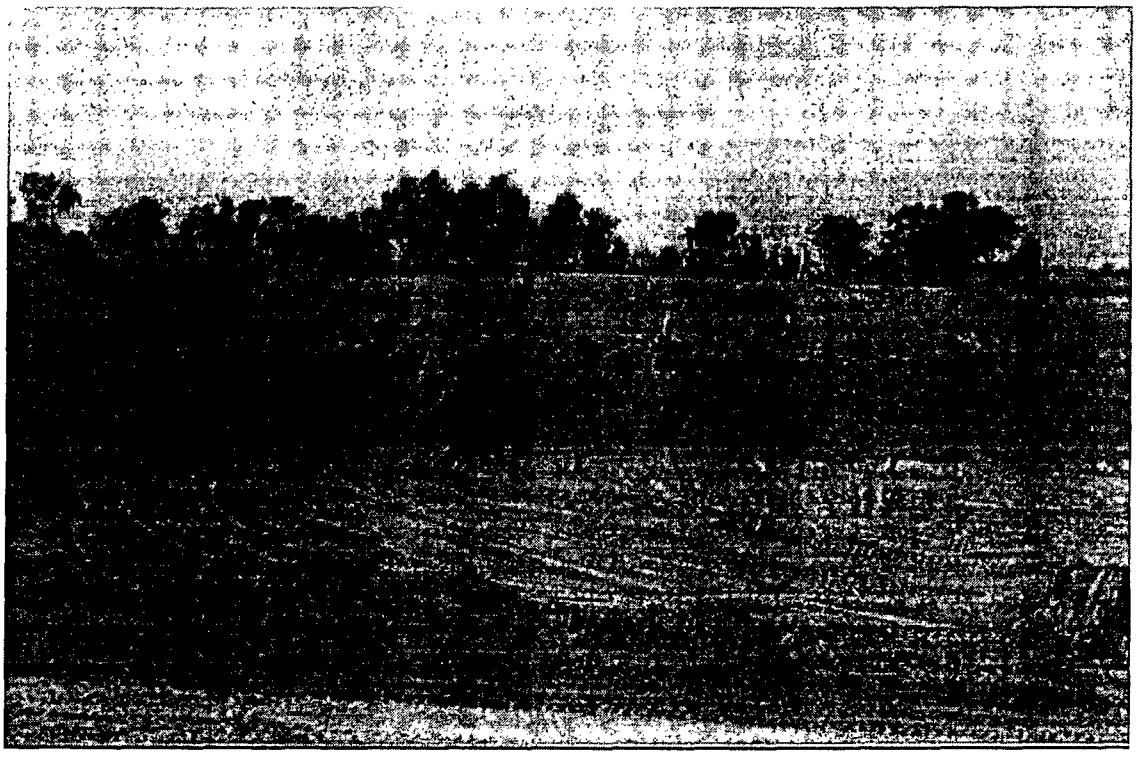
14 – SETTLING TANKS STEEL & SHUTTERING WORKS



15 – INSTALLATION OF FEED PIPE IN SETTLING TANK

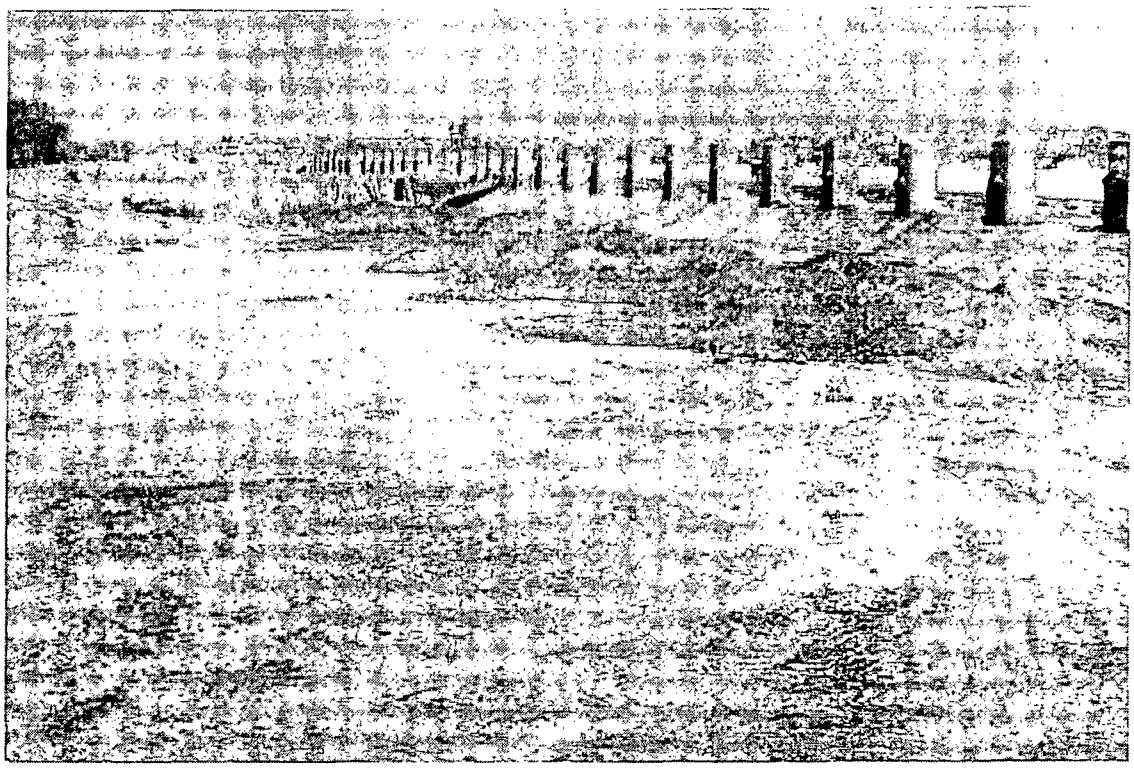


16 – INSTALLATION OF DELIVERY FOR DISTRIBUTION TANKS

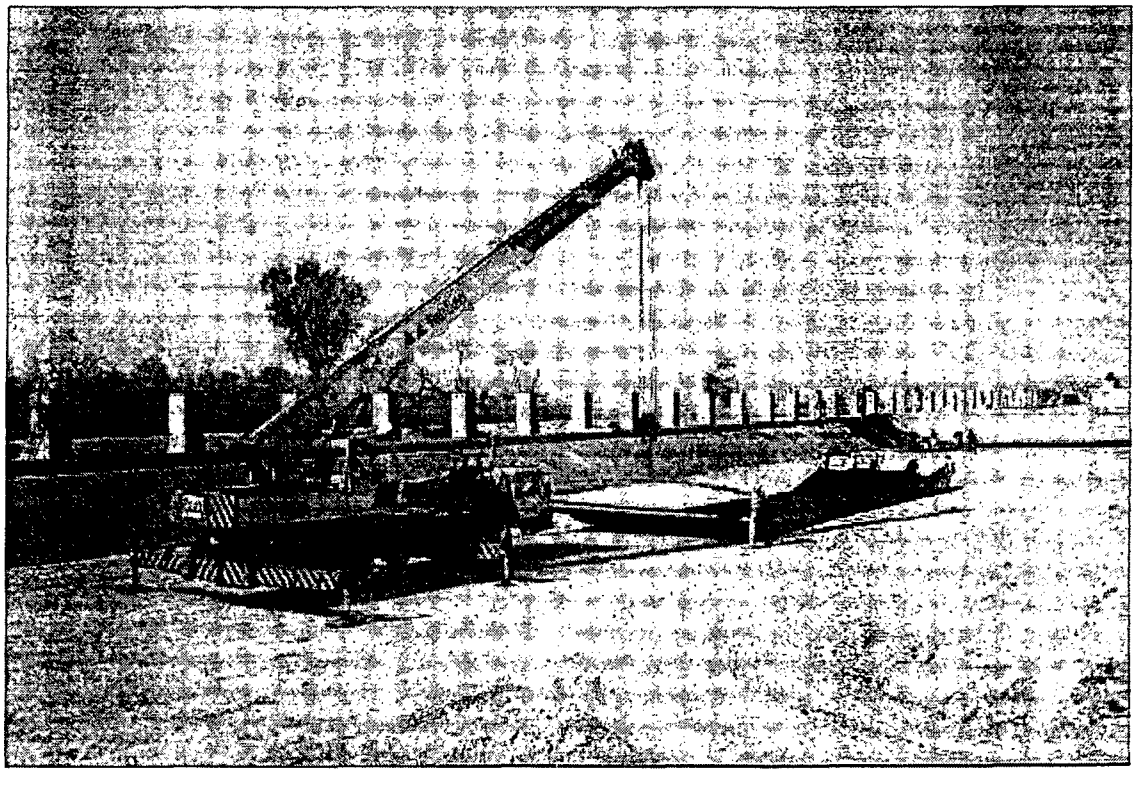


17 - EARTH WORK FOR EFFLUENT LAGOONS

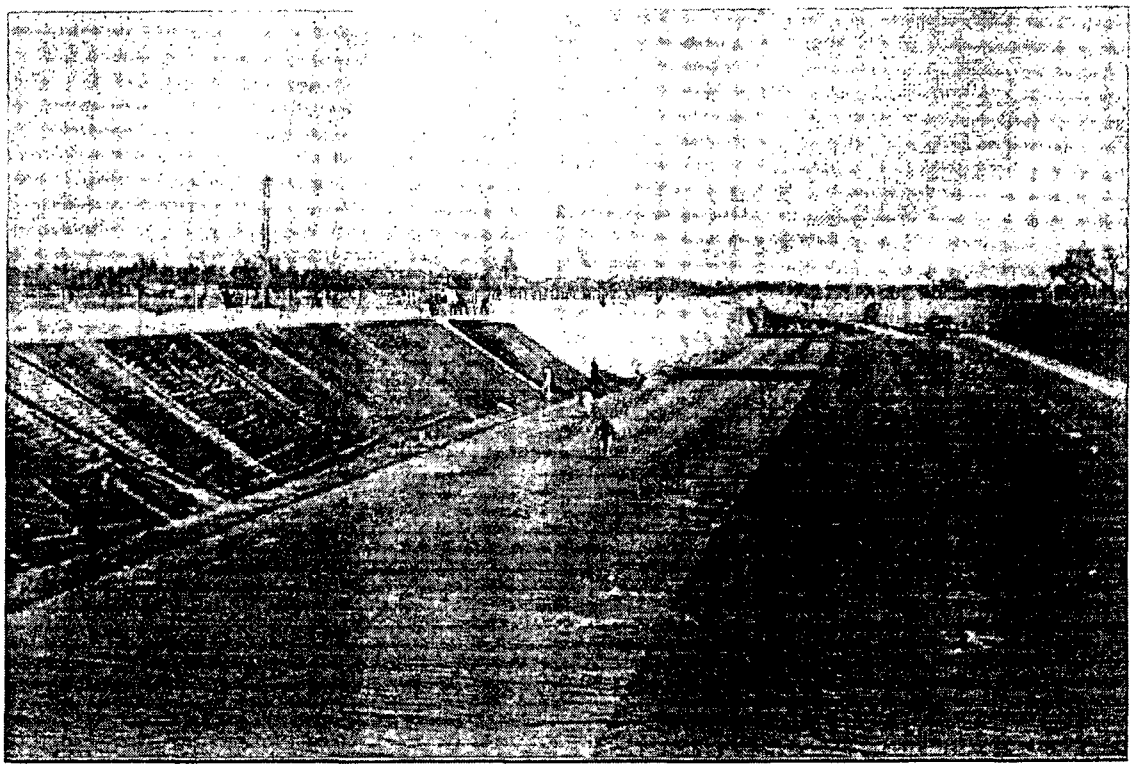
18 – PREPARATION OF DIKES FOR EFFLENT LAGOONS



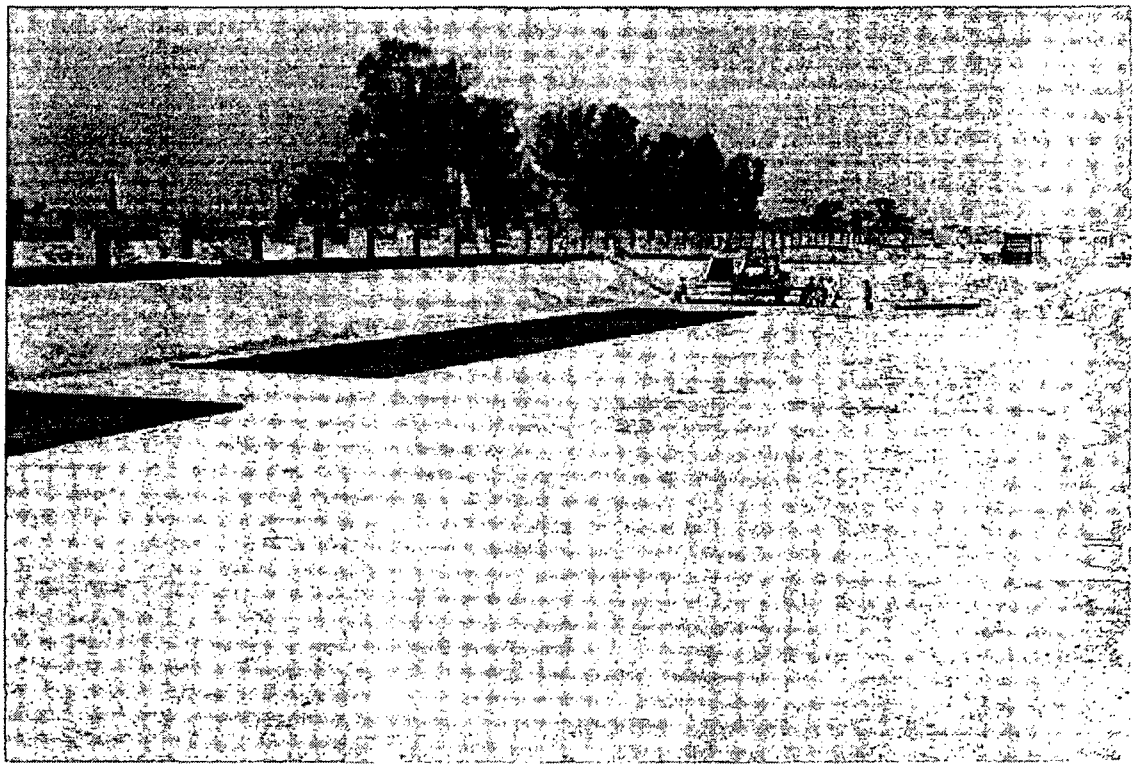
19 – PIPE SUPPORS CONSTRUCTION



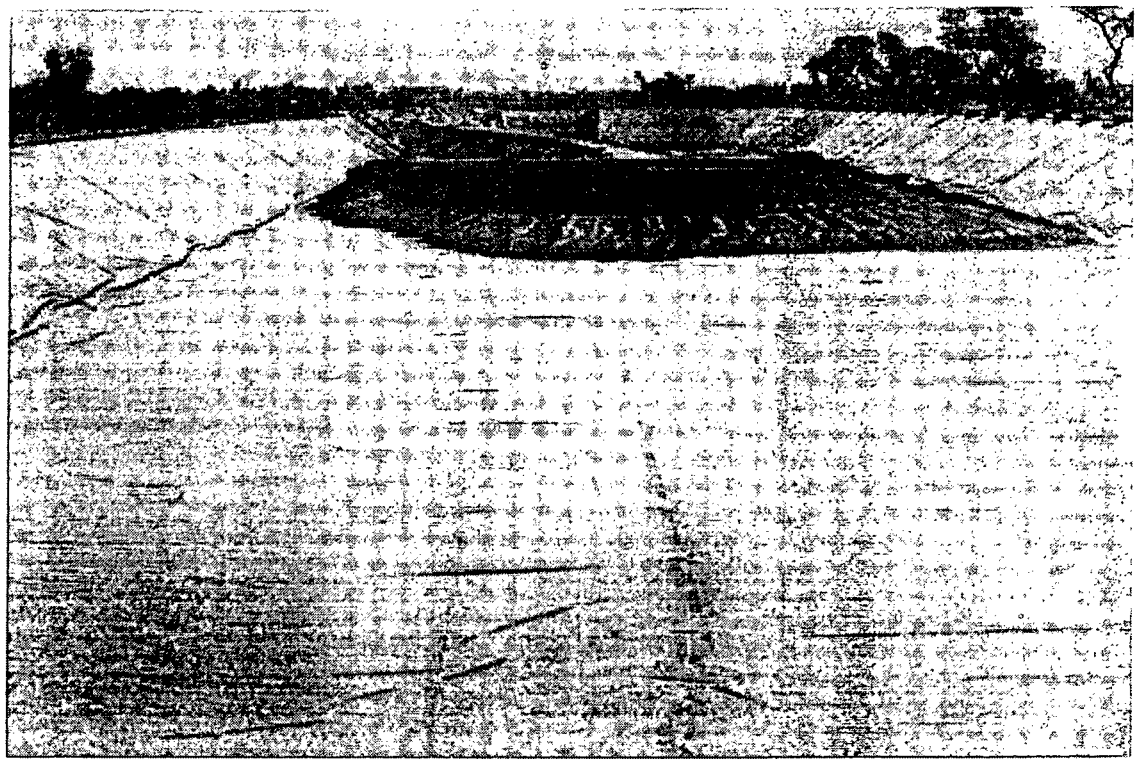
20 – INSTALLAITON OF GEOMEMBRANE IN EFFLUENT TREATMENT LAGOONS



21 – GEOMEMBRANNE COVER INSTALLATION

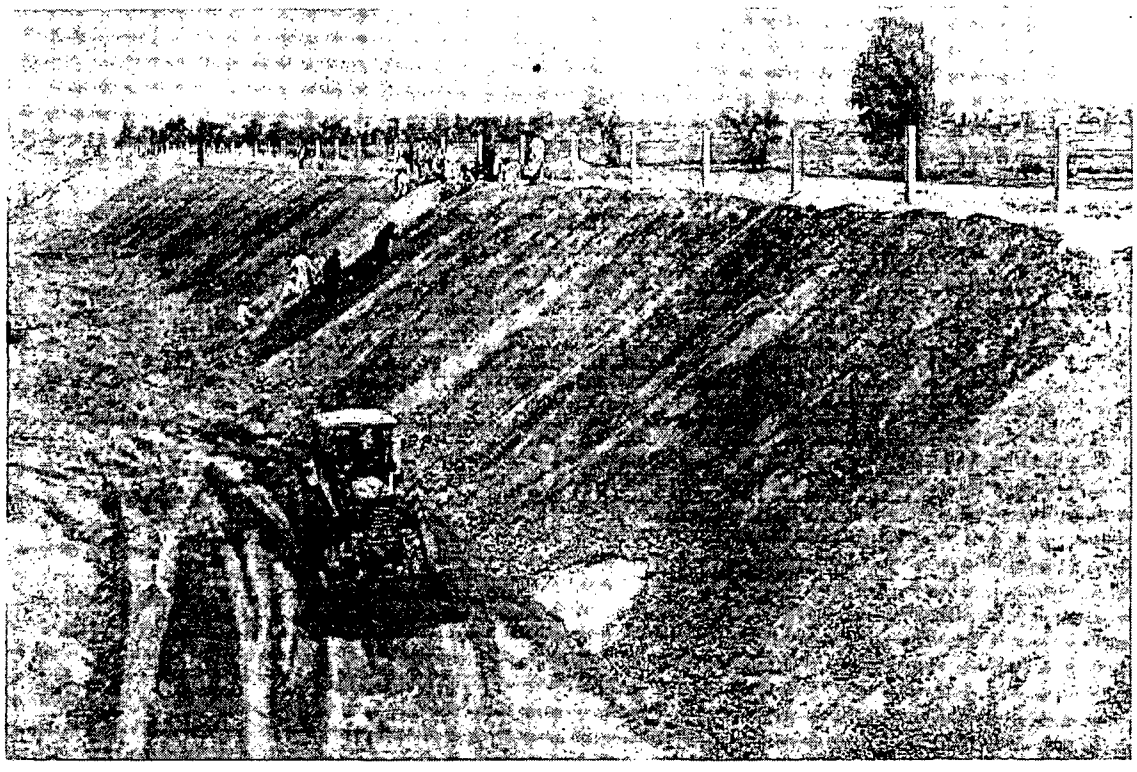


22 - GEOMEMBRANE LAYING

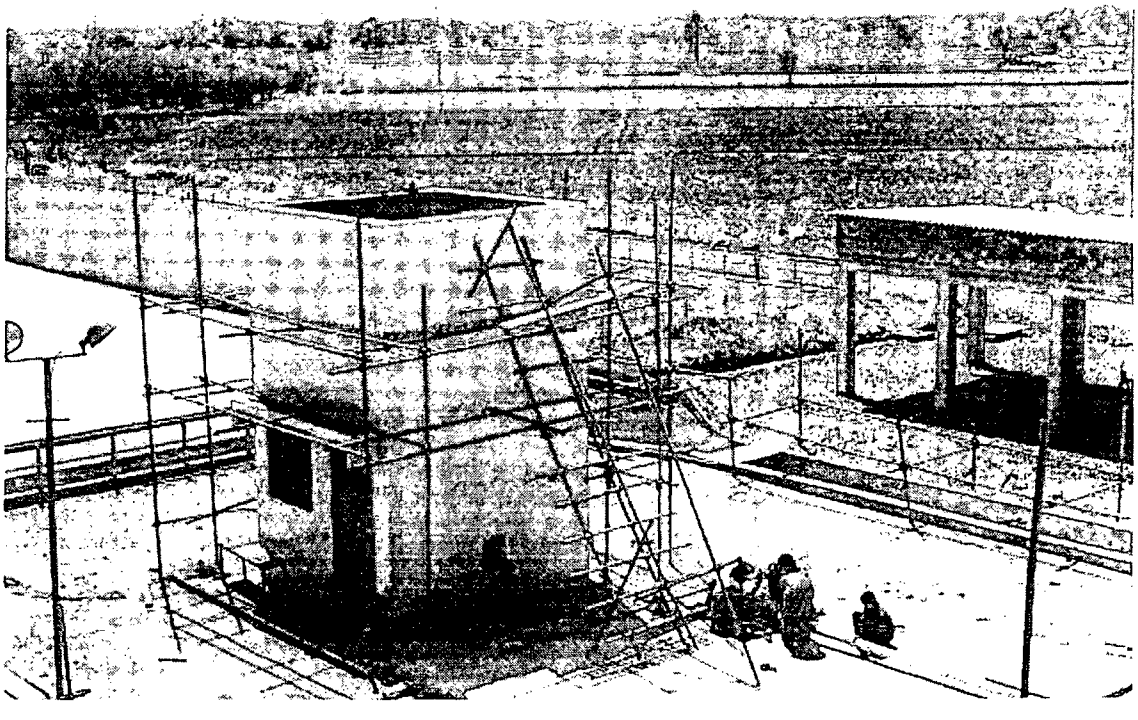


23 – CLAY COVER OVER GEOMEMBRANE

24 – PREPARATION OF EMBANKMENTS FOR PERMANENT SLUDGE LAGOONS

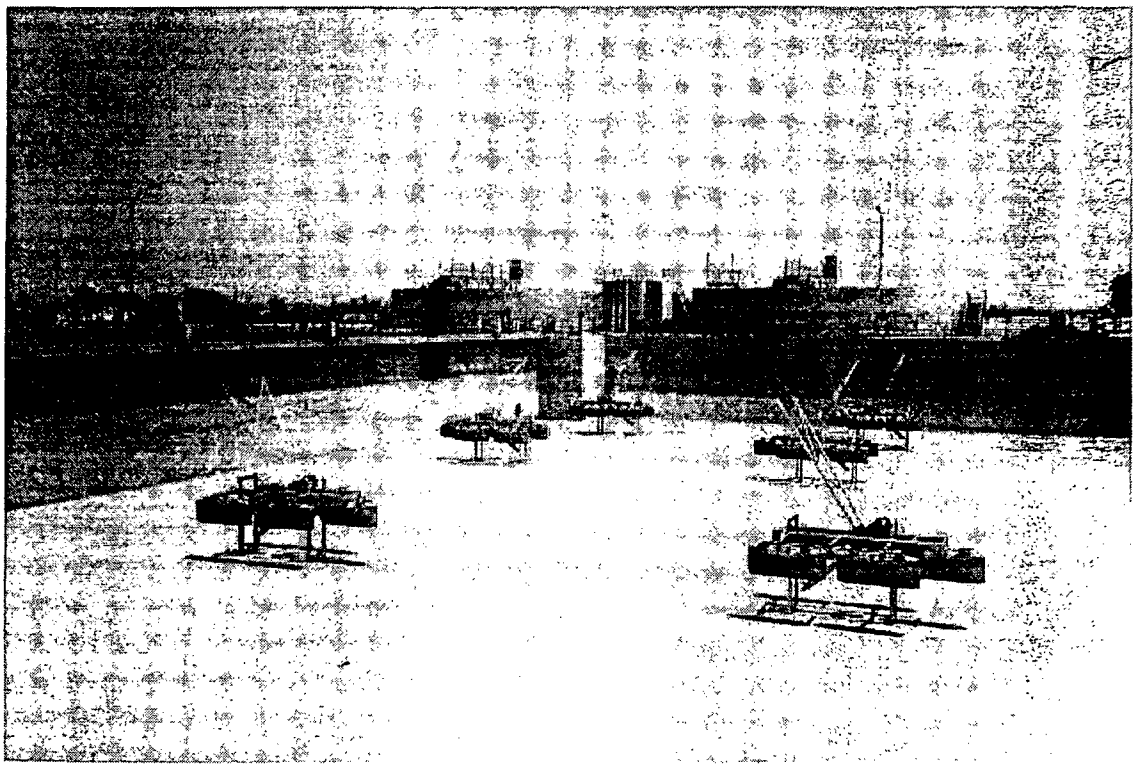


25- - PERMANENT SLUDGE LAGOONS DIKES UNDER CONSTRUCTION

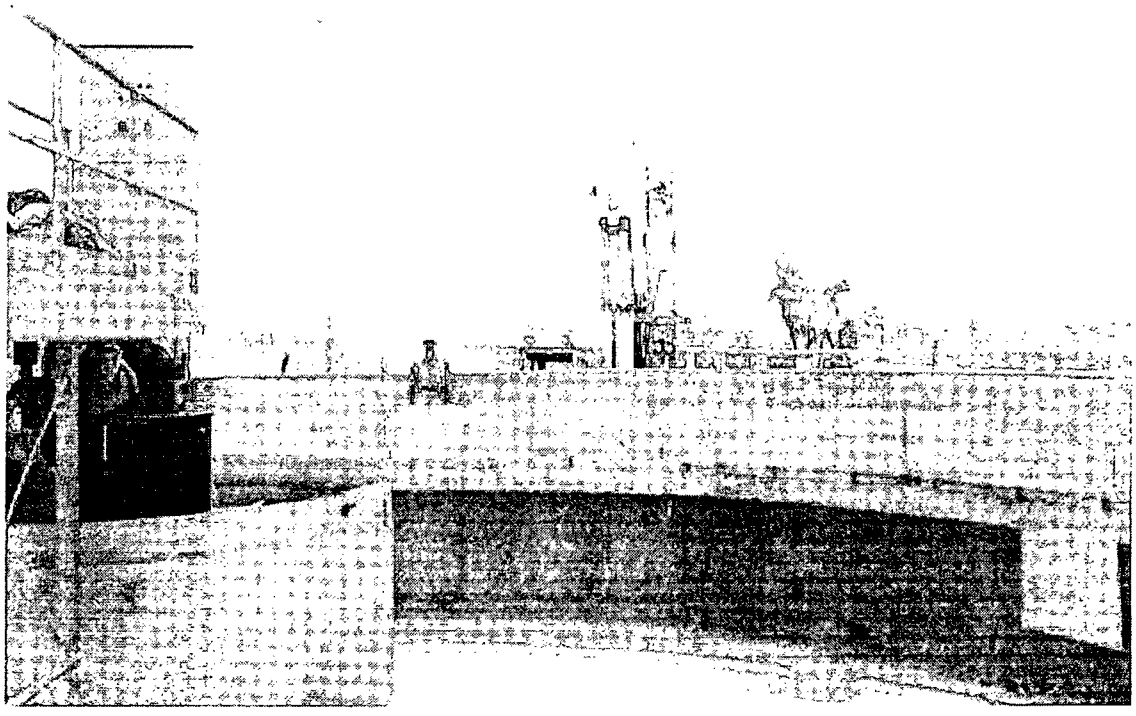


26 – FINISHING WORK ON TUBEWELL ROOM

27 – AUTOMATIC SCREEN IN OPERATION

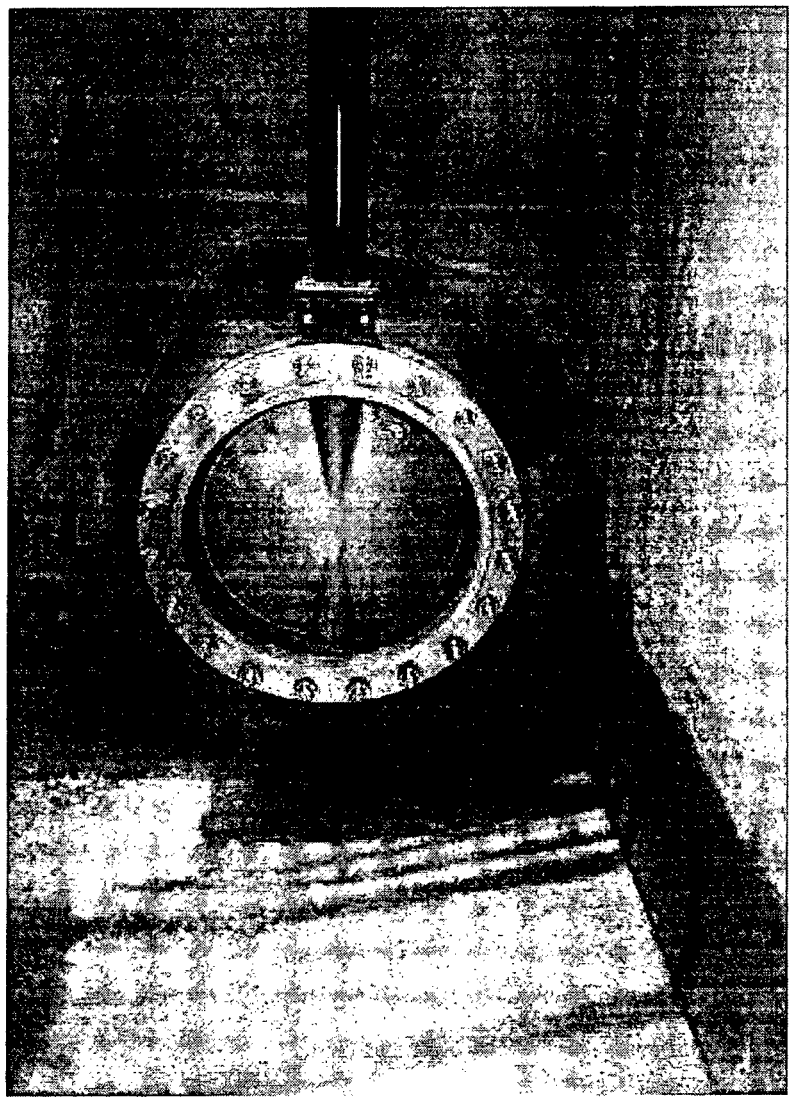


28 – INSTALLATION OF AERATORS

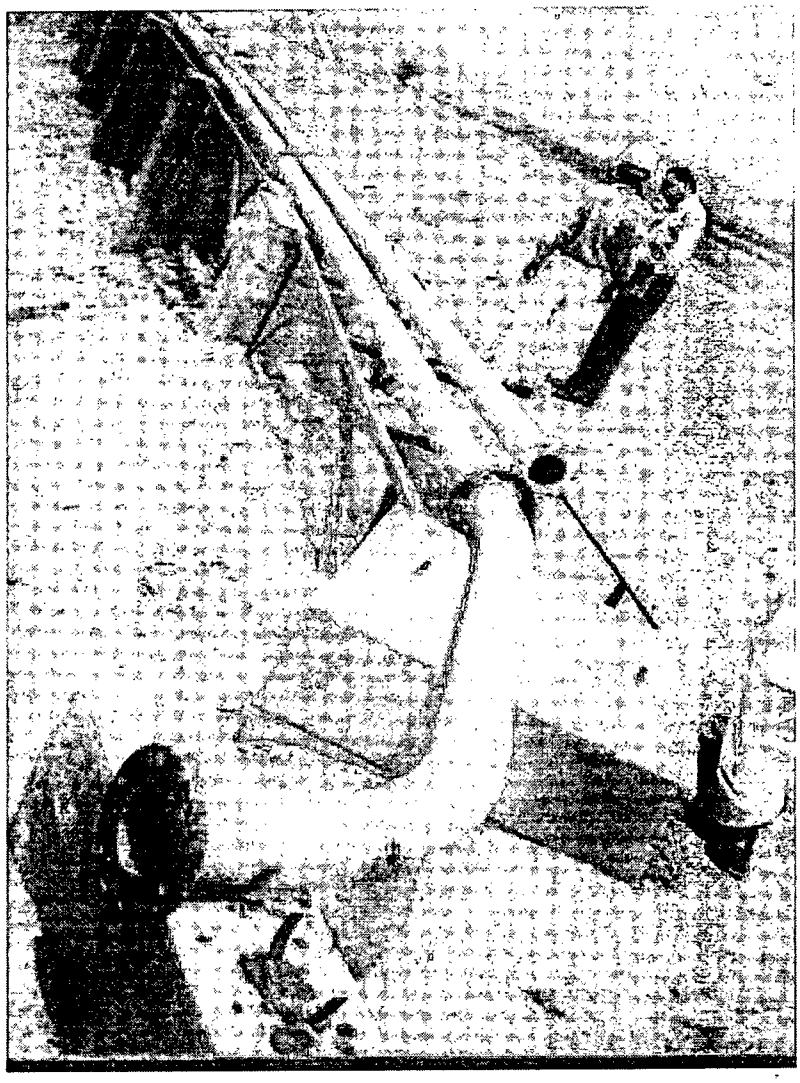


29 – INSTALLATION OF SETTLING TANK EQUIPMENT

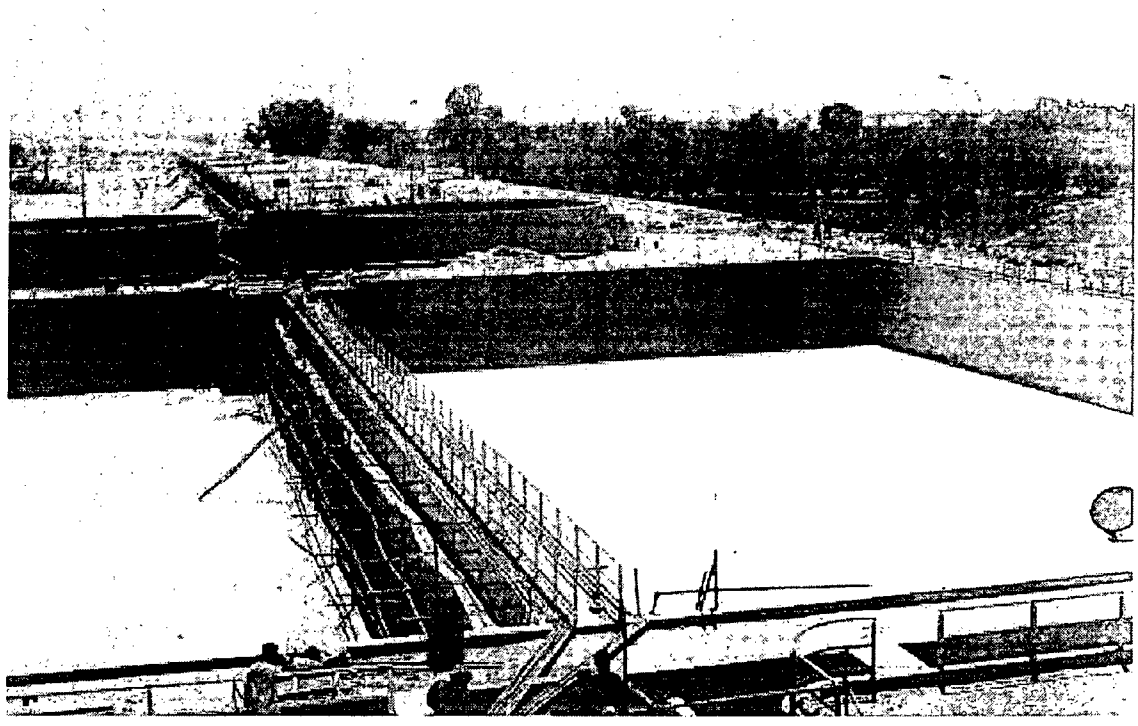
30 – SUBMERSIBLE PUMP INSTALLATION



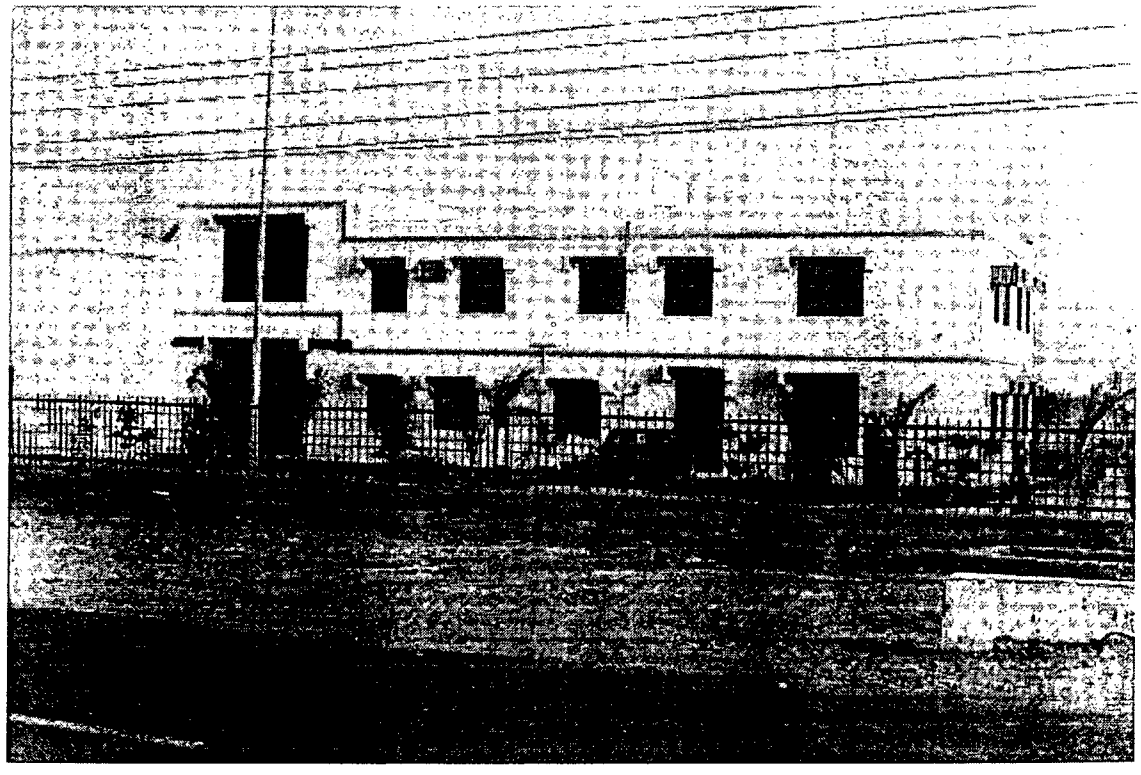
31 – 600 MM DIA VALVE IN PUJP PIT



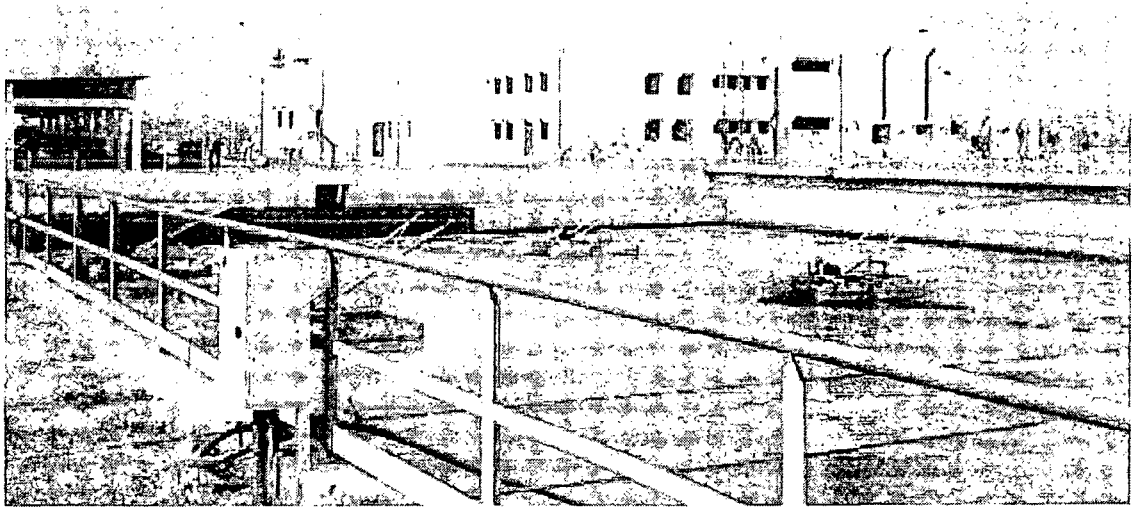
32 – FIBERGLASS SLUDGE PIPE LINE INSTALLATION



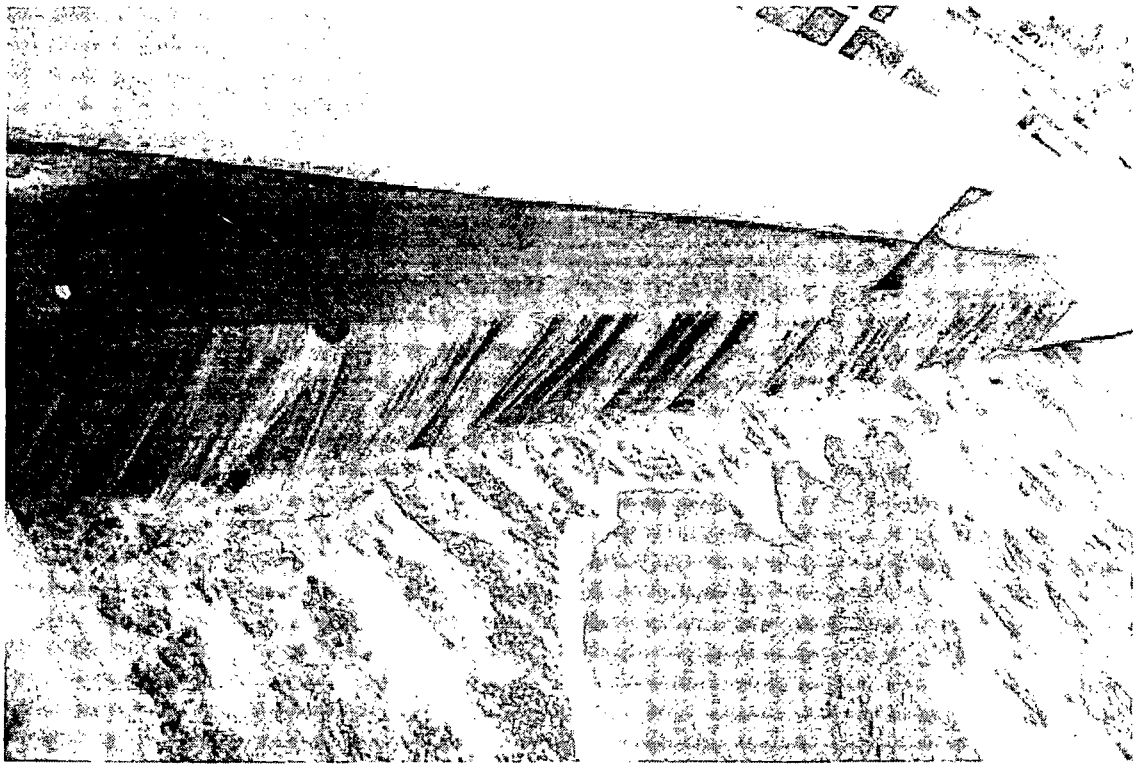
33 – GENERAL VIEW OF PLANT AFTER CONSTRUCTION



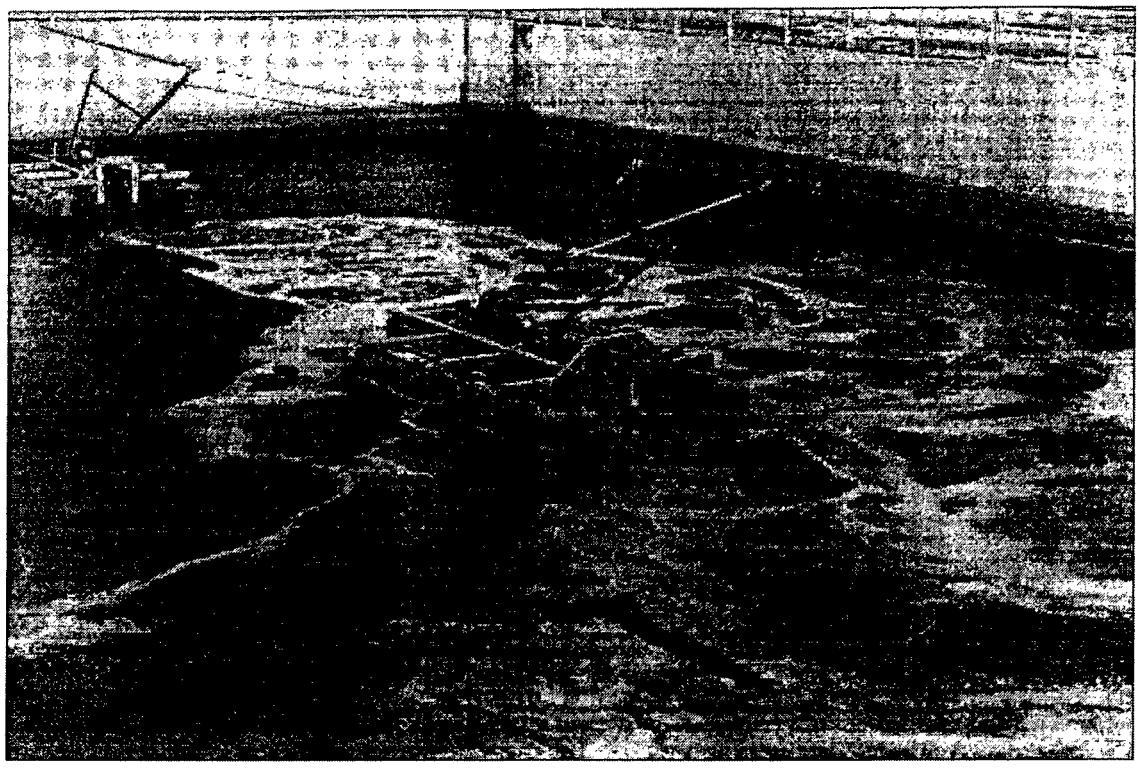
34 – VIEW OF CONTROL BUILDING



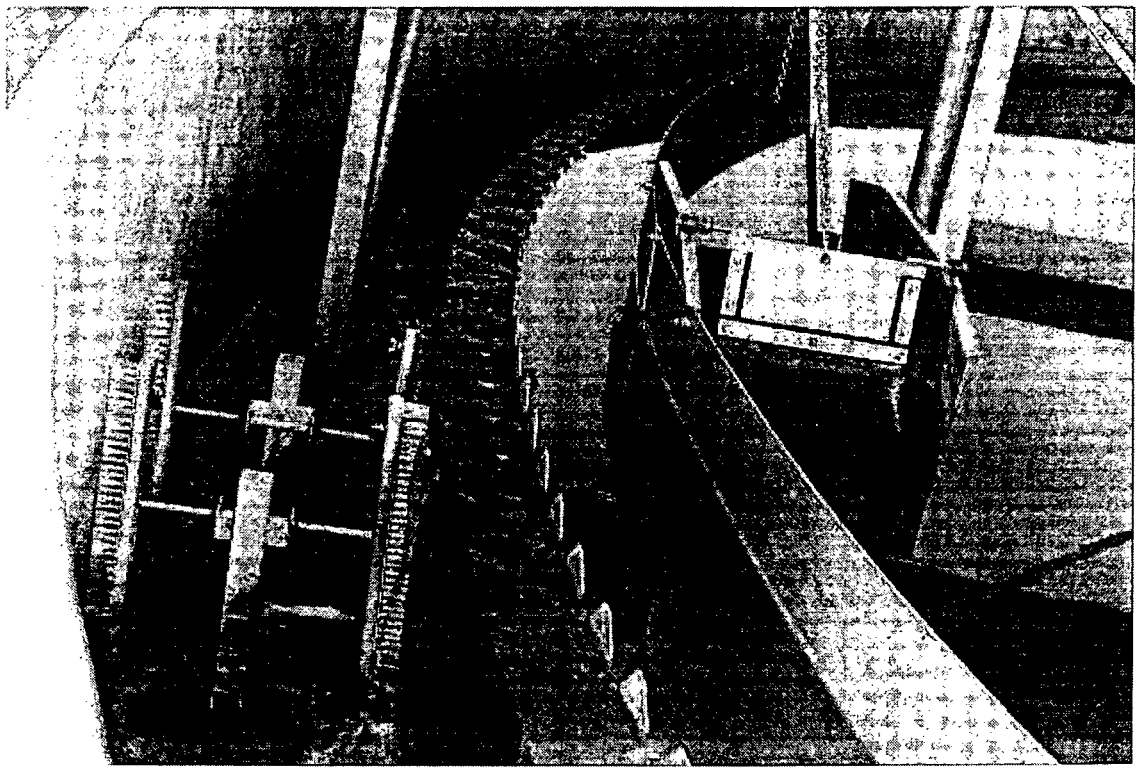
35 – VIEW OF CONTROL BUIDLING & EQUALIZATION TANKS



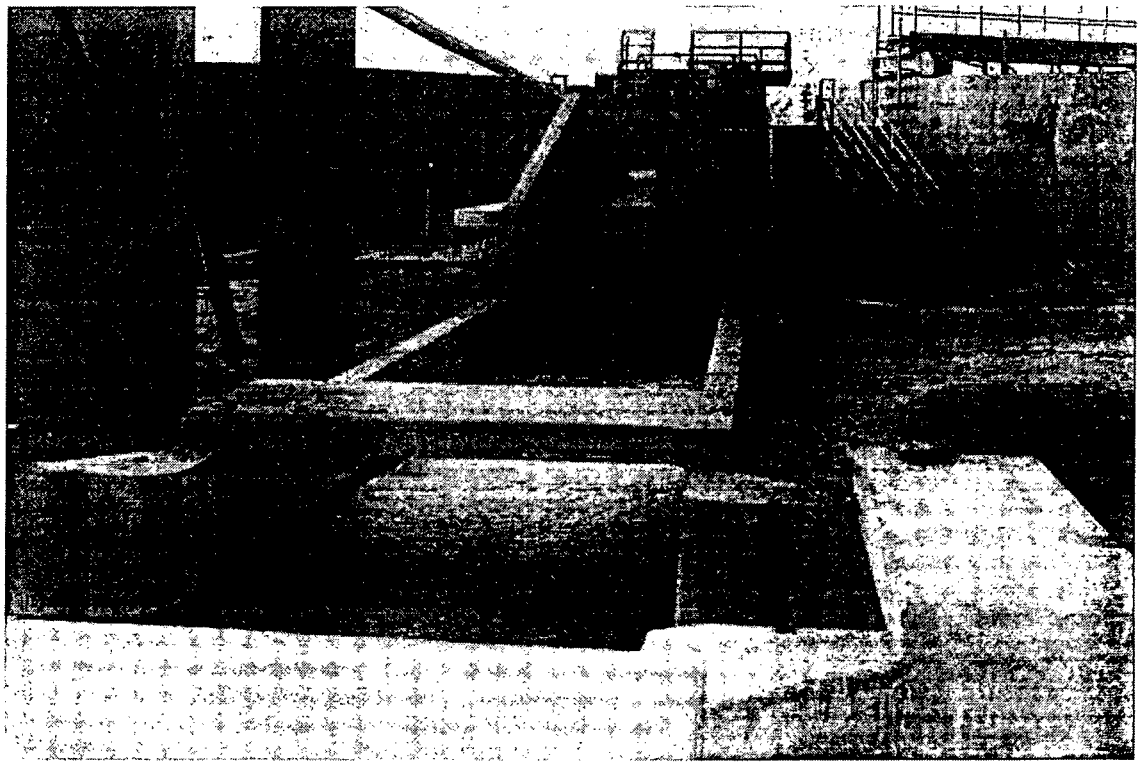
36 – EFFLUENT INFLOW IN THE QUALIZATION TANK



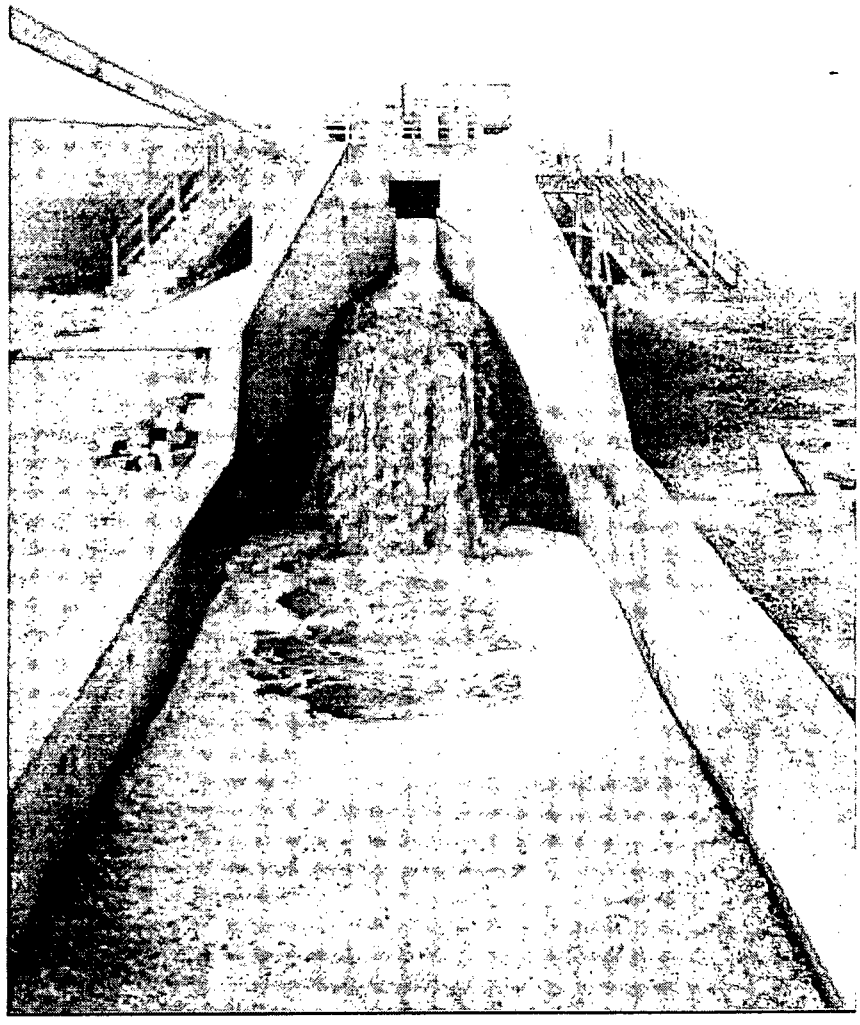
37 – AERATORS IN ACTION



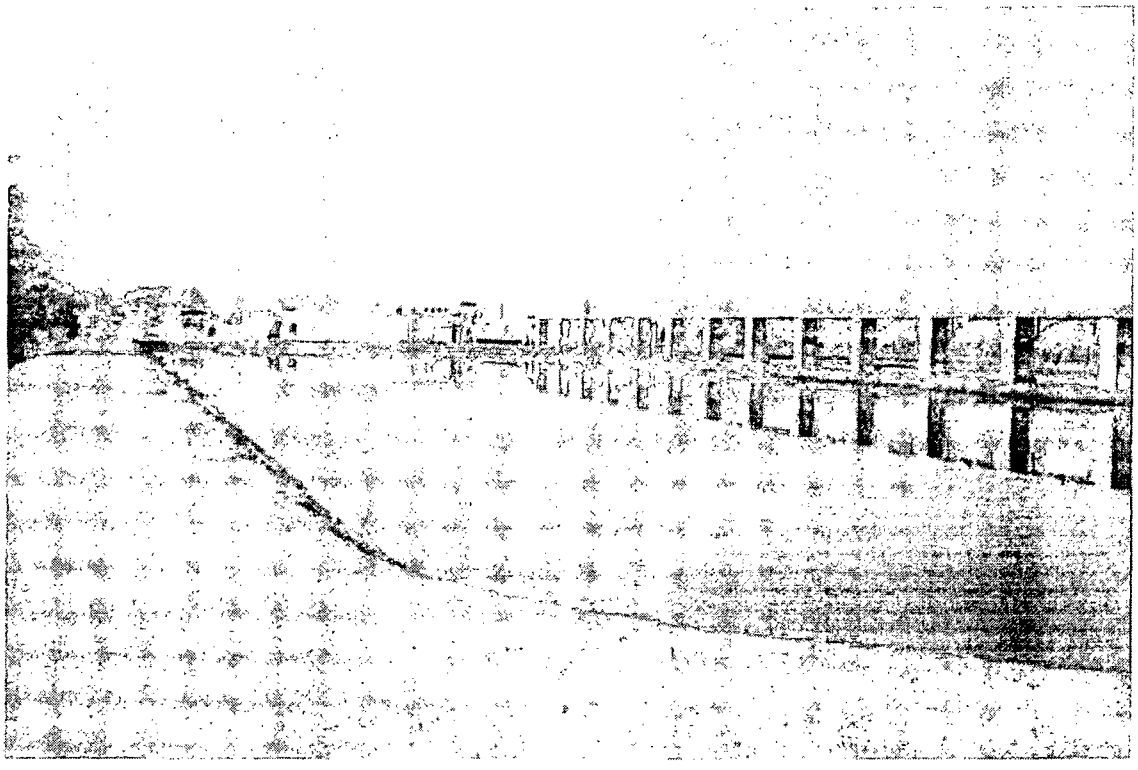
38 – OVERFLOW IN THE SETTLING TANK



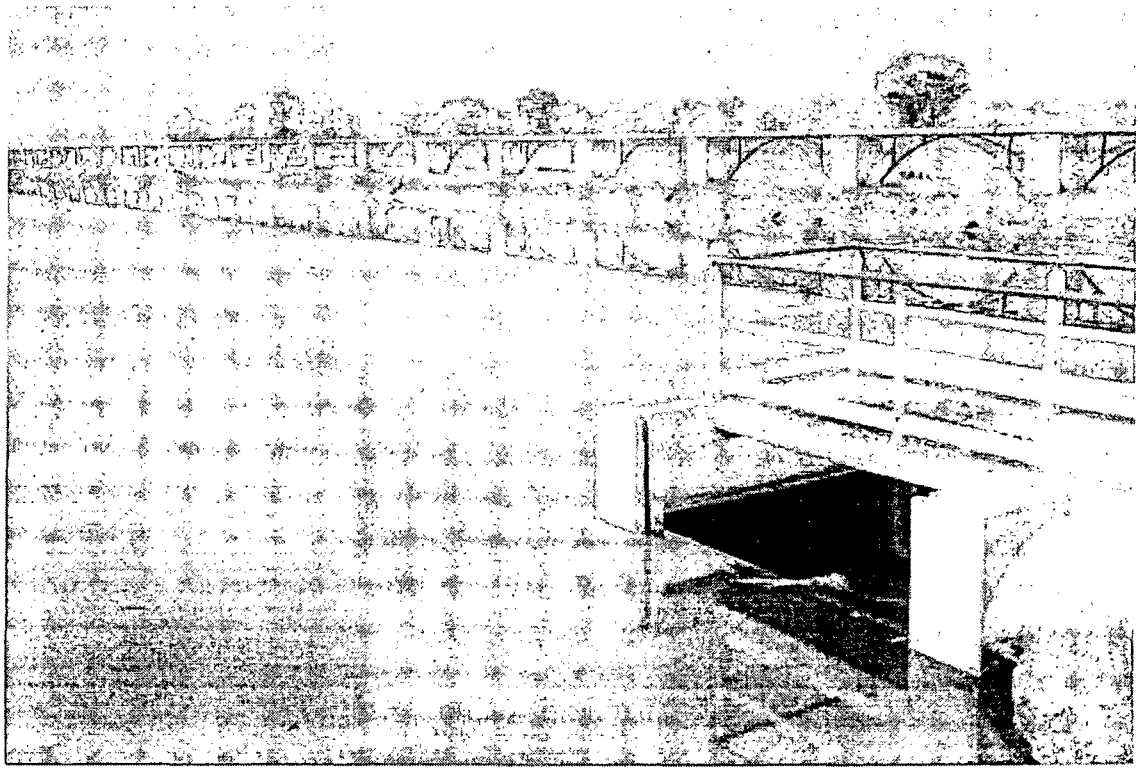
39 – PRE-TREATED EFFLUENT FROM SETTLING TANKS



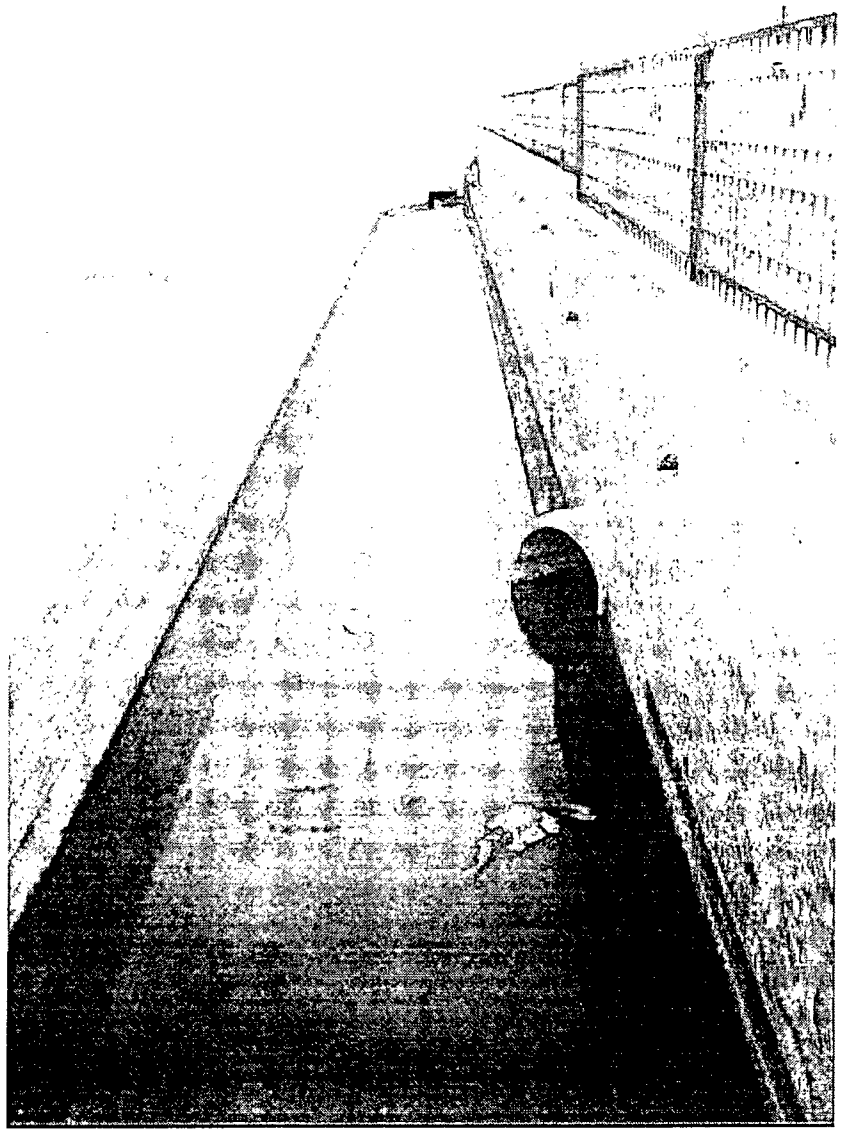
40 – PLANT AT WORK



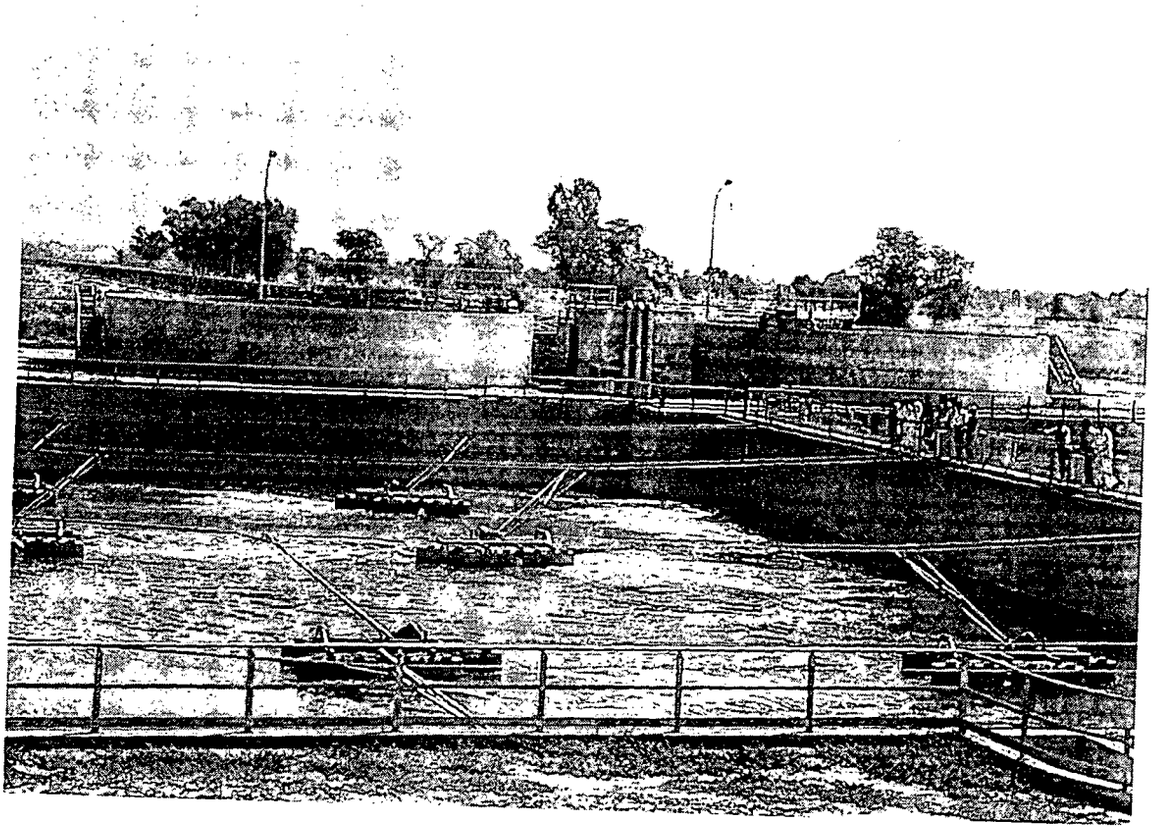
41 - EFFLUENT TREATMENT LAGOONS IN OPERATION



42 – THE OVER FLOW OF PRE-TREATED EFFLUENT IN WEIR



43 – OUT FALL DRAIN



44 – PLANT IN WORKING CONDITION