



Ⓢ Lodos activados sin tratamiento primario.

Computer Assisted Procedure for the Design and Evaluation of
Wastewater Treatment Systems

CCCC AAAA PPPPP DDDDD EEEEE TTTTTTTT PPPPP CCCCC
CC CC AA AA PP PP DD DD EE TT PP PP CC CC
CC AA AA PP PP DD DD EE TT PP PP CC
CC AA AA PPPPP DD DD EEEEE TT ==== PPPPP CC
CC AAAAAA PP DD DD EE TT PP CC
CC CC AA AA PP DD DD EE TT PP CC CC
CCCC AA AA PP DDDDD EEEEE TT PP CCCCC

Version 2.06

Hydromantis, Inc. Copyright(c) 1985,1986 Jan. 1989
S/N: HM01.0203.0206

Single-User License Issued to:

* Comision Nacional del Agua *
* Gerencia de Tratamiento de Agua*
* Cda. de J. Sanchez Azcona #1723*
* Mexico, D.F. 03100 *
* 524-3795 *

Input data file: UTLA3.TXT

SMALL FACILITIES

IS NOT A VALID PROCESS CARD
LIQUID LINE
BLOCK PRELIM
BLOCK ACTIVA
BLOCK FILTRA
BLOCK CHLORI
HLOR NOT A VALID PROCESS - ON BLOCK CARD
SECONDARY SLUDGE LINE
BLOCK BMIX
IX NOT A VALID PROCESS - ON BLOCK CARD
PRIMARY SLUDGE LINE
BLOCK AEROBI
BI NOT A VALID PROCESS - ON BLOCK CARD
BLOCK DRYING
NG NOT A VALID PROCESS - ON BLOCK CARD
WASTEWATER CHARACTERISTICS
AVERAGE FLOW 0.1386 MGD INITIAL 0.1386 MGD (GASTO = 6 L/SEG
TEMPERATURE SUMMER 17 WINTER 14 C
SUSPENDED SOLIDS 460 MG/L
VOLATILE SOLIDS 60 %
BOD5 581 MG/L
SBOD 250 MG/L



COD 1100 MG/L
SCOD 500 MG/L
PH 8.0
PO4 20 MG/L
TKN 51 MG/L
NH3 35 MG/L
OIL AND GREASE 94 MG/L
DESIRED EFFLUENT CHARACTERISTICS
UNIT COSTS (COSTOS COMUNES DE PLANTAS, ESTIMADOS)
EIGHT INCH PIPE 4.4 DLL/PIE CODO 44 D/U TEE 70.4 DLL/U VALV 770 DLL/UNID
BUILDING COST 22 DLL/PIE2 = 236.5 DLL/M2
WALL CONCRETE 22 DLL/YARDA3 = 286 DLL/M3
SLAB CONCRETE 99 DLL/YARDA3 = 129.8 DLL/M3
EXCAVATION COST 4.4 DLL/YARDA3 = 5.874 DLL/M3
ELECTRICITY .0495 DLL/KWHR
CRANE RENTAL 74 DLL/HR
LABOR RATE 7.2 DLL/HR
OPERATOR 5.5 DLL/HR
INSTALLATION LABOR RATE 7.7 DLL/HR
LAND COST 4057.5 DLL/ACRE (APROX. 10000 DIIs/HA)
MARSHALL AND SWIFT INDEX 1200 ESTIMADOS A SEPT. 1998
LARGE CITY EPA INDEX 320
ENGINEERING NEWS RECORD INDEX 6580.7
PIPE COST INDEX 595
END
CONTROL CARDS
ANALYSE
OUTPUT QUANTITIES
LIST TOTAL OF 10 TRAINS
GO I=10.00 NYD=20.00 NYC=1.5
1 COST ANALYSIS INPUT PARAMETERS
Interest rate 10.000 %
Planning period 20 years

0 UNIT PRICES AND COSTS INDICES
I Building 22.00 \$/sq ft
I Excavation 4.40 \$/cu yd
I Wall concrete 22.00 \$/cu yd
I Slab concrete 99.00 \$/cu yd
I Marshall and Swift index 1200.00
I Crane rental 74.00 \$/hr
I EPA construction cost index 320.00
D Canopy roof 15.75 \$/sq ft
I Labor rate 7.20 \$/hr
I Operator class II 5.50 \$/hr
I Electricity 0.05 \$/kWhr
D Chemical costs
Lime 0.03 \$/lb
Alum 0.04 \$/lb
Iron salts 0.06 \$/lb
Polymer 1.62 \$/lb
I Engineering News Record cost index 6580.70
D Handrail 25.20 \$/ft
I Pipe cost index 595.00
I Pipe installation labor rate 0.00 \$/hr
I Eight inch pipe 4.40 \$/ft
I Eight inch pipe bend 44.00 \$/unit



1 Eight inch pipe tee 70.40 \$/unit
 1 Eight inch pipe valve 770.00 \$/unit
 1 Comision Nacional del Agua, Gerencia de Tratamiento de Agua, Mexico

0 ANALYZE 1 TRAIN No 1
 0 INFLUENT

LIQUID CHARACTERISTICS

FLOW (MGD)	SOLIDS (mg/l)	(mg/l)	(mg/l)
Maximum 0.1386	Suspended 460.00	BOD5 581.00	TKN 51.00
Average 0.1386	Volatile 60.00 %	BOD5S 250.00	NH3 35.00
Minimum 0.1386	Settleable 15.00	COD 1100.00	NO2 0.00
		CODS 500.00	NO3 0.00
Temp (W) 14.0 C	Oil & grease 94.00	PO4 20.00	
Temp (S) 17.0 C	Cations 160.00		
pH 8.0	Anions 160.00		

0 SLUDGE CHARACTERISTICS

	Primary	Secondary	Chemical
Volume (gal/d)	0.00	0.00	0.00
% Solids	0.00	0.00	0.00
% Volatile	0.00	0.00	0.00

1 Comision Nacional del Agua, Gerencia de Tratamiento de Agua, Mexico

0 ANALYZE 1 TRAIN No 1

0 BAR SCREENS

0D Wet weather flow factor	0.350E+01
Wet weather flow	0.485E+00 MGD
D Maximum head loss through screens	0.500E+00 feet
D Bar spacing	0.100E+01 inches
D Width of bars	0.313E+00 inches
D Bar shape factor	0.167E+01
D Slope of bars	0.100E+02 degrees
Width of channel	0.200E+01 feet
Depth of channel	0.216E+01 feet

1 Comision Nacional del Agua, Gerencia de Tratamiento de Agua, Mexico

0 ANALYZE 1 TRAIN No 1

0 QUANTITIES FOR BAR SCREENS

0 Length of channel	0.140E+02 feet
Volume of earthwork	0.342E+03 cu ft
Volume of wall concrete	0.658E+02 cu ft
Volume of slab concrete	0.543E+02 cu ft
Operation manpower	0.317E+01 pers-hrs/yr
Maintenance manpower	0.801E+01 pers-hrs/yr
Energy requirement	0.727E+03 kWhr/yr
O & M material and supply cost	0.200E+01 %

LIQUID CHARACTERISTICS

FLOW (MGD)	SOLIDS (mg/l)	(mg/l)	(mg/l)
Maximum 0.1386	Suspended 460.00	BOD5 581.00	TKN 51.00
Average 0.1386	Volatile 60.00 %	BOD5S 250.00	NH3 35.00



Minimum 0.1386 Settleable 15.00 COD 1100.00 NO2 0.00
 CODS 500.00 NO3 0.00
 Temp (W) 14.0 C Oil & grease 94.00 PO4 20.00
 Temp (S) 17.0 C Cations 160.00
 pH 8.0 Anions 160.00

0 SLUDGE CHARACTERISTICS
 Primary Secondary Chemical
 Volume (gal/d) 0.00 0.00 0.00
 % Solids 0.00 0.00 0.00
 % Volatile 0.00 0.00 0.00

1Comision Nacional del Agua, Gerencia de Tratamiento de Agua, Mexico

0 ANALYZE 1 TRAIN No 1

0ACTIVATED SLUDGE

0D Hydraulic detention time 0.300E+02 hours
 D Solids detention time 0.250E+02 days
 D Underflow concentration 0.100E+05 mg/l
 Volume of aeration tank 0.173E+00 MG
 Mixed liquor suspended solids 0.600E+04 mg/l
 Food to microorganism ratio 0.775E-01
 Sludge production 0.347E+03 lbs/day
 Sludge recycle ratio 0.583E-04

1Comision Nacional del Agua, Gerencia de Tratamiento de Agua, Mexico

0 ANALYZE 1 TRAIN No 1

0QUANTITIES FOR ACTIVATED SLUDGE

0 Diameter of package plant 0.480E+02 feet
 Volume of reinforced slab concrete 0.153E+04 cu ft
 Operation manpower required 0.126E+04 pers-hrs/yr
 Maintenance manpower required 0.695E+03 pers-hrs/yr
 Energy required 0.104E+05 kWhr/yr
 O & M material and supply costs 0.285E+01 %

LIQUID CHARACTERISTICS

FLOW (MGD) SOLIDS (mg/l) (mg/l) (mg/l)
 Maximum 0.1386 Suspended 30.00 BOD5 3.65 TKN 10.00
 Average 0.1386 Volatile 60.00 % BOD5S 1.45 NH3 10.00
 Minimum 0.1386 Settleable 0.00 COD 5.48 NO2 0.00
 CODS 2.18 NO3 0.00
 Temp (W) 14.0 C Oil & grease 0.00 PO4 15.00
 Temp (S) 17.0 C Cations 160.00
 pH 8.0 Anions 160.00

0 SLUDGE CHARACTERISTICS
 Primary Secondary Chemical
 Volume (gal/d) 0.00 4036.89 0.00
 % Solids 0.00 1.00 0.00
 % Volatile 0.00 60.00 0.00

1Comision Nacional del Agua, Gerencia de Tratamiento de Agua, Mexico

0 ANALYZE 1 TRAIN No 1

0PACKAGE PLANT GRAVITY FILTRATION



OI Hydraulic loading rate 0.500E+01 gpm/sq ft
 I Number of filter cells 4
 D Minimum backwash rate 0.200E+02 gpm/sq ft
 D Minimum backwash period 0.100E+02 min
 I Number of backwash volumes 2
 Filter area required (hydraulic loading) 0.192E+02 sq ft
 Filter area required (peak flow) 0.257E+02 sq ft
 Design filter surface area 0.257E+02 sq ft
 Volume of backwash surge tank 0.343E+03 cu ft

0-----
 1Comision Nacional del Agua, Gerencia de Tratamiento de Agua, Mexico

=====

0 ANALYZE 1 TRAIN No 1

0QUANTITIES FOR GRAVITY FILTRATION

0 Volume of reinforced slab concrete 0.696E+02 cu ft
 Volume of reinforced wall concrete 0.445E+03 cu ft
 Width of backwash surge tank 0.495E+01 feet
 Length of backwash surge tank 0.990E+01 feet
 Volume of earthwork required 0.529E+04 cu ft
 Electrical energy required 0.120E+04 kWhr/year
 Maintenance manpower required 0.136E+03 pers-hours/year
 Operation manpower required 0.208E+03 pers-hours/year
 O & M material and supply costs 0.500E+01 %

LIQUID CHARACTERISTICS

FLOW (MGD)	SOLIDS (mg/l)	(mg/l)	(mg/l)	(mg/l)
Maximum 0.1386	Suspended 12.00	BOD5 1.45	TKN 10.00	
Average 0.1386	Volatile 60.00 %	BOD5S 1.45	NH3 10.00	
Minimum 0.1386	Settleable 0.00	COD 2.18	NO2 0.00	
		CODS 2.18	NO3 0.00	
Temp (W) 14.0 C	Oil & grease 0.00	PO4 15.00		
Temp (S) 17.0 C	Cations 160.00			
pH 8.0	Anions 160.00			

0 SLUDGE CHARACTERISTICS

	Primary	Secondary	Chemical
Volume (gal/d)	0.00	4036.89	0.00
% Solids	0.00	1.00	0.00
% Volatile	0.00	60.00	0.00

1Comision Nacional del Agua, Gerencia de Tratamiento de Agua, Mexico

=====

0 ANALYZE 1 TRAIN No 1

0-----

0LIQUID PREL 0 ACTI 0 FILT 0

0-----

0 ===> COST SUMMARY <===

0	OPER	MAINT		TOTAL					
	CAPITAL	AMMORT	LABOR	LABOR	POWER	MATERIAL	CHEMICAL	O & M	
	UNIT	COST	COST	COST	COST	COST	COST	COST	
	\$	\$/yr	\$/yr	\$/yr	\$/yr	\$/yr	\$/yr	\$/yr	
SCREENS	33994	3989	16	30	35	679	0	760	
ACT SLUD	161568	18923	6716	2627	514	3988	0	13845	
FILTRATI	295524	34696	1108	514	59	11746	0	13427	
0SUB TOTAL	491087	57609	7841	3172	610	16415	0	28032	

0DIRECT COSTS



Control and instrument 7 \$
 Profit/overhead 108040 \$
 0 SUB TOTAL (OTHER DIRECT) 108047 \$ TOTAL CONSTRUCTION COST 599135 \$

0INDIRECT COSTS

Misc non const costs 29956 \$
 Admin/legal 11982 \$
 201 planning 20969 \$
 A/E design fee 48360 \$
 Inspection 11982 \$
 Contingencies 47930 \$
 Technical costs 11982 \$
 0 SUB TOTAL (INDIRECT) 183161 \$
 0LAND COSTS 36517 \$ 9. acres
 INTEREST DURING CONSTRUCTION 61410 \$

0ADMINISTRATIVE COST 2142 \$/yr
 LABORATORY COST 10987 \$/yr
 0TOTAL PROJECT COST 880222 \$ TOTAL CONSTRUCTION COST 599135 \$
 FINAL YEAR O & M 41169 \$/yr TOTAL STEP III COST 810893 \$
 INITIAL YEAR O & M 41169 \$/yr PRESENT WORTH (APP. A) 1264407 \$
 1Comision Nacional del Agua, Gerencia de Tratamiento de Agua, Mexico

=====

0 ANALYZE 1 TRAIN No 1

0USER CHARGE SUMMARY

D EPA grant 0.750E+02 %
 D State grant 0.000E+00 %
 D Allowance for financing 0.300E+01 %
 Bonds Percent Rate Life
 D Revenue 100.00 10.00 30
 D General obligation 0.00 0.00 30
 D Other 0.00 0.00 30
 D Number of billing units 0.506E+05 \$/T gal
 D Existing sewer rate 0.000E+00
 D Persons per household 0.350E+01
 D Gallons/capita/day (water use) 0.100E+03 gal/cap-day
 D Current annual O & M cost 0.000E+00 \$/year
 Total project cost 0.880E+06 \$
 EPA Eligible cost 0.844E+06 \$
 Local share 0.254E+06 \$
 Annual debt service 0.269E+05 \$/year
 Principal and interest reserve 0.385E+04 \$/year
 Contingency reserve 0.385E+04 \$/year
 Total annual operating cost 0.758E+05 \$/year
 Treatment cost
 Cost per 1000 gallons treated (new system) 0.150E+01 \$/T gal
 Cost per 1000 gallons treated (total system) 0.150E+01 \$/T gal
 Cost per billing unit (new system) 0.150E+01 \$/T gal
 Cost per billing unit (total system) 0.150E+01 \$/T gal
 Cost per household (new system) 0.157E+02 \$/month
 Cost per household (total system) 0.157E+02 \$/month

1

0 Present TRN	Project TRN	Construct TRN	O&M TRN	Energy TRN
Worth #	Cost #	Cost #	Cost #	Cost #
1264407 1	880222 1	599135 1	41169 1	610 1

0TRAIN N 1



LIQUID PREL 0 ACTI 0 FILT 0