

behavior at design temperature 20 °C  
s.w.d. 4 m

**C-1294 CM tank model**  
tentative Activated Sludge

wastewater flow 1600 m3/day  
BOD in (mg/L) 300  
TKN in (mg/L) 34

mgd 0.423

1057.6 lbBOD/day  
119.9 lbTKN/day

AOR 2137.9 lbO2/day 89.1 lbO2/hr

1586.5 lbO2/day  
551.4 lbO2/day

**cell I**

length 12 m  
width 16 m  
s.w.d. 4 m  
13.12 (feet)

tank volume 768.0 m3  
0.203 mg

residence (days) 0.48

HP/mg 50  
60  
70

HP for mixing 10.1  
12.2  
14.2

if CFM for mixing 248 CFM

lbBOD/day 1000 cu.ft. 19.5  
lbBOD/day acre 22293.2

MLSS 3500

f/m 0.089 (whole tank)

**cell II**

length 12 m  
width 16 m  
s.w.d. 4 m  
13.12 (feet)

tank volume 768.0 m3  
0.203 mg

residence (days) 0.48

HP/mg 50  
60  
70

HP for mixing 10.1  
12.2  
14.2

if CFM for mixing 248 CFM

hi speed low speed  
HP share 50.9 39.2  
1.00 50.9 39.2

total tankage volume 0.406 mg  
total residence time 0.96 days

AOR	AOR/SOR	SOR	HP at 2.5 lb/h per HP	de-rate 5	de-rate 10	de-rate 15	HP/mg	HP for mixing
89.1	0.7	127.3	50.9	53.6	56.6	59.9	50	20.3
89.1	0.6	148.5	59.4	62.5	66.0	69.9	60	24.3
89.1	0.5	178.2	71.3	75.0	79.2	83.8	70	28.4

**quick-and-dirty diffused aeration estimates**

CFM for diffused aeration/oxygen transfer 1128 CFM AOR/SOR = .37 1.7% per feet  
HP estimate for oxygen 48.7 HP

**notes:**

- I'm taking TKN at full value for HP calculation, although some nitrogen would be used up for normal biological/BOD processes
- I have used 20°C ww temperature although from G's data, actual temperature values would be much higher, ave 33.14°C
- approach would be extended/activated sludge alternative using f/m= c. 0.1 and 300 gpd/sq.ft. for a secondary clarifier
- Possible preliminary quote (low speed):  
two 25 HP mechanical aerators  
about 184 1-m tubes (= 1128 \* s.f. / 8 CFM per 1-m = 1128\*1.3/8) with two 30 HP blowers (30 HP > 48.7/(2\*0.92)HP per cell)
- While there would be just one 24m \* 16m basin, a 2-cell arrangement would be recommended/baffled/other
- "BODout as per EPA model" figures have been left from lagoon model to be able to re-use spreadsheet for multiple calc types therefore, no specific meaning should be construed in this specific case

**other related calcs:**

secondary clarifier diameter at 300 gpd/sq.ft. 12.9 m  
waste sludge flow Qw for various sludge age values, 30 mg/L SSout, underflow SS at 0.7 % Hammer.412

age days	WAS (see footnote # 1)				RAS (see footnote #2)			tentative at BFP gpm at 4% regime
	Qw mgd	Qw gpd	Qw gpm	lb/day dry	Qw/flow in	Qr mgd	Qr/Q	
5	0.0388	38770	26.9	2260.7	9.2 %	0.3416	80.8 %	22.6
10	0.0185	18479	12.8	1077.5	4.4 %	0.3821	90.4 %	10.8
14.5	0.0122	12182	8.5	710.3	2.9 %	0.3947	93.4 %	7.1
15	0.0117	11715	8.1	683.1	2.8 %	0.3957	93.6 %	6.8
25	0.0063	6305	4.4	367.6	1.5 %	0.4065	96.2 %	3.7

dry weight sludge as predicted by Hammer.440 Figure 11-40 as a function of f/m known to be "reasonable" for municipal but may differ considerably if industrial ww

lb/day dry 709.6 2 \* K \* mgd \* 8.33 \* BOD5 mg/L

tentative BFP gpm for possible inlet SS settings ballpark/alternate figures at above specified net BFP hours per day

SS settings	BFP gpm
3%	2840 gpd
3.5%	2434 gpd
4%	2130 gpd

sludge yield (lb/day dry / lbBOD/day) = 0.67

**foot note # 1** Assuming treated wastewater exits clarifier with say 30 mg/L SS and using entered/calculated tank MLSS,V solving for Qw in sludge age equation (11-12- Hammer.412) for various age settings results in WAS estimates as shown

**foot note # 2** Tentative Qr's result from performing somewhat crude mass balance around secondary clarifier (solving for RAS):  
(Q+Qr) \* MLSS = Q \* 30 mg/L + (Qw+Qr) \* underflow SS in mg/L  
However (Hammer.413 - Table 11-12) indicates 20-40% return sludge rates for conventional & 50-100% for extended (It all depends how lucky we are with underflow SS: 0.5 - 2%)  
Hypothetical sludge flow "seem" too small for BFPs; probable poor prediction I guess  
Although not shown, it is assumed some thickener/DAF is used to concentrate settler underflow up to 4% (Hammer.443: "As a general rule, the solids content must be at least 4 percent for feasible dewatering")

**quotables/summary**

low speed aerators, high speed aerators a possibility  
retrievable tubes & blowers local sourcing of PE/PVC pipe/panel/other  
"drive and drawing" pack for local fabrication: inlet wells, skimmer/scraper arm, weirs, sludge hopper, walkway, scum box  
tentative BFP upon review, entry level if at least to break new ground

DAF unit, already relayed for selection; if DAF not used aeration probably to double