A HIGH-RATE AEROBIC PROCESS FOR *IN SITU* DOMESTIC SEWAGE BIOTREATMENT.

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Introduction. The worldwide potable-water shortage foreseeable in the near future, needs recycling of sewage A sensible strategy is point-of-discharge treatment to minimize cost and operating failure risks. With this approach, a process is devised to treat sewage with immobilized activated sludge on inert support particles in an air-lift continuous reactor. A recycle loop for the sewage is passed through a venturi injector at a flow sufficient to aspire air and disperse it in the water, providing oxygen transfer and mixing.

.Methods.

A 30 L glass vessel is set with a concentric acrylic vertical cylinder with a 5 cm clearance between the vessel and the cylinder walls and bottom. A recycle loop is driven by a commercial pump through a Venturi injector taking in air. The air/wáter emulsion is discharged at the riser bottom (Figure 1)..

A Hach kit was used for DQO.assay. Volatile suspended solids were measured as the difference between total solids and ashes.

Figure 1.- Photograph of the reactor and its auxiliary devices. The upper piping carries the Venturi injector (in black)

Table 1.- Mixing time (s) versus superficial air velocity (cm/s).

Recycle flow (cm^3/s)	v_G (cm/s)	Mixing Time (s)
95.1	0.15	33
100.2	0.16	29
102.5	0.17	20
110.7	0.18	13

A gassing-out technique was used to measure oxygen transfer rate coefficient (Figure 2) and an optical technique was used to measure mixing time (Table 1).

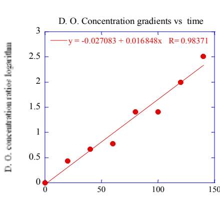

Figure 2.- D. O. gradient ratio logarithms versus aeration time plot at 0.17 cm/s air rate, [1] $k_L a_V$ is 60.5 h^{-}.

Batch and continuous culture sludge treatment of synthetic sewage was carried out in the Venturi-aireated air-lift reactor. The experimental variables were hydraulic retention time, number of supports with adhered sludge and DQO in the feed. From batch cultures the Monod kinetics parameters, and from continuous cultures without supports the growth stoichiometry, were determined.

The continuous cultures were kept at the designed operating variables conditions for three retention times before sampling and three hours later another sample was assayed to corroborate the steady-state. The mean of two runs is reported.

Results.

The total DQO conversion rate is calculated from inlet, outlet DQO concentrations and hydraulic retention time. The outlet DQO concentration was used to calculate the suspended sludge DQO uptake rate with the kinetic and stoichiometric parameters. So the calculated adhered sludge DQO uptake rate could be discriminated. Table 2 shows the values for these measurements and calculations. A patent claim is being pursued.

Table 2. Retention time (h) supports number, feed DQO (mg/L), suspended volatile solids (mg/(L), total conversion rate (Rqt, mg DQO/L h), simulated suspended sludge DQO uptake rate (mgDQO/L h), calculated adhered sludge DQO uptake rate (mgDQO/L h).

t (h)	Supports	DQO_i	SSV	Rqt	Rqs	Rqa
3	200	445. 8	390	127. 3	30.8	96.5
3.5	200	493.8	350	126.9	26.5	100.4
4	200	497.5	380	116.4	25.9	90.5
3	500	1015.2	550	296.2	47.1	249.
3	1000	1008.3	150	271.2	13.3	257.9
5	500	1378.8	850	279.5	76.3	203.3
4	500	1049.5	700	159.3	62.7	96.4

Conclusions.

For the low and medium support charge and DQO in feed, a constant uptake rate of circa 0.5 mgDQO/L-h-support is observed. The highest uptake occurs with 500 supports.

If the suspended sludge kinetics obeys Monod kinetics in the presence of supports, adhered sludge shows a higher reaction rate than suspended growth..

The process designed is simple and only needs a prolonged-use pump. It meets the Mexican norm.

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