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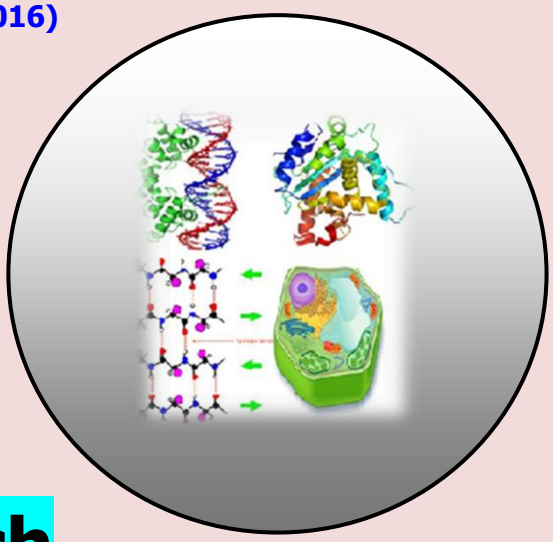

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RESEARCH PAPER

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Coffee Industries Sludge Treatment and Bio-gas Production

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ABSTRACT

The ratio of volatile to total solids (Vs/Ts) indicates the organic fraction in the sludge solids and its level of digestion. The sludge under aeration has tendency for the solids to settle down slowly with disagreeable odor of putrefaction. Activated sludge digested easily, Humus sludge undergoes decomposition more slowly than undigested sample. Aerobically digested bio solids dewatered easily on drying. An aerobically contain large quantity of gas. Primary sludge when anaerobically digested produces about twice as much CH_4 gas as does waste activated sludge. As the solid sludge dried the gases escape, leaving a well cracked surface with an order of garden loom. Composed solids or recycled compost or wood chips had been used for composting process. Typical design of activated sludge is based on BOD loading, food to microorganism ratio (F/M) (without including the return sludge flow) per unit of mixed liquor volatile suspended solids (MLVSS) per day is F/M ratio.

F/M ratio = Q x BOD X 10^{-3}/(V x MLVSS)

Mixed Liquor Volatile suspended Solid in Mg/L
Volumetric organic loading Rate = Q x BOD x $10^{-3/}$V
BOD mg/L, Q= Flow rate m^3/day
V= volume of areation tank m^3
Keywords: Volatile, Digester, sludge, bio solids, Anaerobic, Purification, Composting, Microorganism, Suspended solid and Loading rate.

INTRODUCTION

Oxygen is required for oxidation of influent organic matter (BOD) along with cell growth and endogenous respiration with cell growth and endogenous respiration of the microorganism.

It is used as an electron acceptor in the energy, metabolism of the aerobic heterotrophic microorganism present and oxygen requirement can be computed considering the total substrate removal. The aeration equipment must be capable of maintaining a dissolved. Oxygen level of about 2 mg/L in the aeration tank while providing through mixing of solid and liquid phase. Anaerobic treatment is a collection of biological four stepped processes by which microorganism break down bio degradable material present in watery sludge. The most of organic carbon converted to biogas while little goes to sludge production.

1 Kg COD removed = 0.35 nM^3 CH_4 = 3.8 KWH

Total O_2 requirement (g/d) = $\frac{Q\,(So-5)}{t}$ - 1.42 Qw X R + 4.57Q (No-N)

No= Influent Conc. mg/L, N= effluent Conc, 4.57 Q = Conversion factor, f= ratio of BOD_5 to ultimate BOD, So = Influent Sub Conc.

Table 1.

S. No.	Amount of U.D. Sludge	Type of Fermentation	En	Residual sludge (kg)	Type of Products
1	10 kg	Aerobic	$Prod^n$	3-6	CO_2
2	10 kg	Anaerobic	$Prod^n$	0.2	$CH_4 + CO_2$
3	10 kg	Oxidative Respiration	$Prod^n$	0.1	NH_4, CO_2

Table 2. Chemical Composition of Sludge.

S. No.	ITEMS T.S. %	Untreated Pri Sludge range	Digested Pri. Sludge Range	Untreated activated Sludge Range
1	Total dry Solid (T.S.)	5-9	2-5	0.8-1.2
2	Voltage Solid (V.S.)	60-80	30-60	59-88
3	Sludge	6-30	5-20	-
4	Protein	20-30	15-20	32-41
5	Nitrogen	1.5-4	1.6-3.0	2.4-5.0
6	Phosphorus	0.8-2.8	1.5-4.0	2.8-11
7	Cellulose	8-15	8-15	-
8	Iron (Not Fes)	2.0-4.0	3-8	-
9	Silica (SiO_2)	15-20	10-20	-
10	Org. acids (Mg/L)	200-2000	100-600	1100-1700
11	En. energy (KJ/Kg)	23000-29000	9000-14000	19000-23000
12	Alkalinity ($CaCO_3$) Mg/L	500-1500	25000-35000	580-1100

(Source-Metca'f & Eddy (2013) waste water engineering treatment and reuse MC Graw - Hill Inc. (2003).

BIO-CHEMICAL REACTIONS AND EXPERIMENTATION

Bio-degrable organic matter, the Energy production or respiration equation organic matter + bacteria + O_2 $\rightarrow$ CO_2 + H_2O + NH_4^+ + new cells

(CHONS) (Hetrotrophic) (En)

further nitrification and protoplasm synthesis

$NH_4^+ + O_2 + CO_2 + HCO_3^- \xrightarrow[En]{Bacteria}$ $NO_3^- + H_2O + H^+$ New Cell (Protoplasm)

Oxidation of protoplasm

Protoplasm + $O_2 \rightarrow CO_2 + NH_3 + H_2O$ + dead cells

Undigested sludge containing solid bio-mass subjected to anaerobic fermentation and to aerobic fermentation under the optimum conditions of temp (30^oc), and P^H (7.5) in two different digester.

Table 3. Sludge Quantity (Vol. in Tonnes of Dry Solids per Year (TDS/a) of Foreign Countries under E.U.

COUNTRY	2005/06 (TDS/A)	2010 (TDS/A)	2015 (TDS/A)	2020 (TDS/A)
BELARUS	50000	50000	60000	70000
DENMARK	140000	140000	140000	140000
ESTONIA	-	33000	33000	33000
FINLAND	147000	155000	155000	155000
GERMANY	2059351	2000000	2000000	2000000
LATVIA	23940	25000	40000	50000
LITHUANIA	71250	80000	80000	80000
POLAND	523679	520000	800000	950000
RUSSIA	180000	180000	190000	200000
SWEDEN	210000	250000	250000	250000
TOTAL	3405220	3433000	3748000	3928000

(http//wwwpurebalticseaeu/India-Source)

DISCUSSIONS

It is observed from the results as shown in table-(1) that for same weight (10 kg) of bio-mass of un-digested sludge for aerobic process CO_2 is produced with loss of heat bio-mass in the form of sludge varied from 3-6 Kg COD.

For Anaerobic process per 10 kg of Bio-mass, 80 % bio-mass was produced with 75 % of CH_4 as constituent and undigested sludge remains only 0.2 kg COD.

REFERENCES

Chetty, L.S. and PillayII, K. (2015). Application of the Diy carbon tootprint Calculator to a waste water treatment work Sa 41 (2) PP 263-272. (http//www.scieio.org.za/1mg/revistas/was/2/13/6

Metcalf and Eddy (2013). Waste water Engineering treatment and reuse M.C Graw - Hill Inc.

Rao, G.S. (1979). Impact of exponential growth on Indian fossil fuel reserves, *Energy Management* VoL.3, 187-192.

Ahmed, J., Bajpai, S.C., Danshenu, B.G. and Sulaiman, A.T. (1985). Fabrication and performance analysis of some traditional and improved stoves Nig. *Journal Solav En*, 465-70.

Santen, A.V. (1993). Incineration its role in the U.K. waste strategy, PP.18-23, Waste Management.

Hebsy'B. Sheela, M.S.J. Arthur Jacob and K.J. Kuriyan (1997). Crop rotation -A management strategy for rice root nematode. Vol-6 No. 2 *Journal of Environmental Biology*.

Trujullo, D. et. al. (1999). Energy recovery from wastes. Anaerobic digestion of tomato plant mixed with rabbit wastes, *Bio Resource Technology*, 40 (2) 81-84.

Kang, H. (1993). Ultimate anaerobic bio degradability of some agro industrial wastes, *Bio Resources Tech* 44(2) 109-111.

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