

NOVEL BIOGAS TECHNOLOGY FOR WASTEWATER TREATMENT WITH METHANE PRODUCTION

by

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Sri Lanka is the second largest producer of desiccated coconut in the world. The desiccated coconut (DC) industry amounts to 40% of the total export revenue from coconut products. The wastewater generated during the production of desiccated coconut is having a good nutrition value for biogas production but it is harmful to the environment if released without treatment. This is a common problem in many coconut growing countries as that desiccated coconut manufacturing factories emit a high-strength, low-degradable wastewater having a low pH value.

This study was conducted in Sri Lanka, to investigate the applicability of a three-stage anaerobic filter (Up flow anaerobic floating filter–UAFF) system for wastewater treatment of desiccated coconut factories. In this study, laboratory-scale experiments were conducted to recover the biogas as much as possible and to treat the wastewater by using UAFF process.

The experimental set-up was made with three anaerobic filter reactors coupled to a sedimentation tank and a biogas holder. The bacteria growing media is, coconut coir fibres, which facilitate granular bacteria formation, were installed inside the anaerobic digesters. Bacterial seeding was made from cow dung rich wastewater with Bacteria Growing Media. It achieved more than 90% of the removal rate for Chemical Oxygen Demand (COD), Biological Oxygen Demand (BOD) and turbidity, with an average organic loading rate of 1.25 kg COD/m³ day, for coconut wastewater as an influent, during the laboratory scale experiment. Average biogas yield was 2.5 litres (at atmospheric pressure and temperature) per litre of coconut wastewater per day with an average methane percentage of 65%. Hence the average biogas production from the wastewater of a DC mill would be 75m³/ day.

After conducting considerable amount of research works at field level, currently this UAFF system is operating in full scale at number of Desiccated Coconut factories for treated wastewater. Final polishing of treated wastewater is achieving with the help of Facultative pond. Since that the whole treatment system does not consume any electrical power, like conventional treatment systems. Further to that, the Biogas from UAFF system is using for various thermal applications of Desiccated Coconut Mills as a gaseous fuel.

This UAFF system is now using successfully while achieving the standards of Central Environmental Authority of Sri Lanka for other sectors of wastewater treatment like, Distillery wastewater, Brewery wastewater, Sewage and Kitchen wastewater etc. This newly developed UAFF system was patented in Sri Lanka. (Patented No. 14932)

No.s	Institutions using UAFF Biogas System for there Wastewater Treatment (Design and Constructed by myself)	Wastewater generation Cu.m/ day	Approximat Input COD level	Digester Capacity Cu. Meters
01	Michico Milk Products Ltd - Nattandiya.	8	6000	60
02	Polytex Garment Factory – Ekala	100	4500	500
03	Golden Star Hotel – Negombo	18	4000	150
04	Rockland Distillery – Marawila	24	32000	500
05	Sri Lanka Distilleries Ltd. – Wadduwa	20	32000	420
06	Paradise Holyday Village - Negombo	20	4000	150
07	Eden Garden Hotel – Sigiriya.	20	4000	150
08	Weerasiri Café – Kottawa.	30	8000	210
09	Piyara Bakery – Gampaha.	30	9000	210
10	Sadamali RiceMill – Jayanthipura	28	3500	120
11	New Shanthi Rice Mill – Ippologama.	30	3500	120
12	Chadima Rice Mill - Medirigiriya.	30	3500	120
13	Menaka Rice Products (Pvt)Ltd - Polonnaruwa.	60	3500	210
14	Kumarasinghe Rice Mill- Jayanthipura	30	3500	120
15	Ramudi Rice Mill- Medirigiriya	32	3500	120
16	Hasnee Rice Mill- Thambala	15	3500	60
17	Shihara Rice Mill- Polonnaruwa	45	3500	150
18	Capton Rice Mill- Kahatagasdigiliya	32	3500	120
19	Anura Rice Mill- Girithale	23	3500	100
20	Baduwaththa D/C mill - Katana.	20	20000	210
21	Minuwangoda D/C mill- Minuwangoda.	25	20000	220
22	Dunagaha D/C mill - Dunagaha.	22	20000	210
23	Belummahara D/C mill - Belummahara.	25	20000	220
24	Bogamuwa D/C mill - Bogamuwa.	22	20000	210
25	Beligala D/C mill - Beligala.	15	20000	120
26	Sanhida D/C mill - Lunuwila.	24	20000	210
27	Kuddrippu D/C mill - Madampe.	18	20000	140
28	Asian Agro Products(Pvt)Ltd - Kochchikade.	22	20000	210

29	Lanka United D/C mills(Pvt)Ltd- Kuliyapitiya.	19	20000	150
30	Kehellella D/C mill - Kehellella	24	20000	240
31	E A M Malibon textile garments (pvt) Ltd- Pelmadulla	25	4500	150
32	Maxies Company (Pvt) Ltd- Piggery at Budjampola	60	12000	420
33	Maccalum Breweries Cy. Ltd- Megoda	70	8000	550
34	Pussalla Farm & Slaughter house+ Piggery, Kosgama	50	12000	480
35	Al- Haqqaniyya Arabic College- Geliyoa, Kandy	15	4500	120
36	Alankulama Farm- Slaughter house- Anuradhapuraya	20	12000	210
37	Mini Meat Mart Company- Slaughter house -Kochchikade	5	12000	60
38	M.S Meat products - Slaughter house-Marawila	10	12000	120
39	Piggery Farm – Galewela	40	12000	360
40	Theresa D/C mill - Theresa road, Katana.	20	20000	240
41	HNB - Marawila	1	4500	8
42	HNB - Wettala.	1	4500	8
43	Jumana rice mill - Minneriya.	30	3500	120
44	Chandra d/c mill - Katana	12	20000	60
45	Monty guesthouse - Ampara	32	4500	140
46	Calton sweet house (pvt) ltd – Negombo	40	9000	280
47	Serendipol (pvt) ltd - Kuliyapitiya factory	30	20000	280

1. Special Advantages of this novel system

- No electrical power is necessary for the operation of this New Anaerobic Filter waste water treatment system.

Note :- Calculated power requirement for conventional type waste water treatment system (equal to the wastewater treatment system of middle scale Garment factory in Sri Lanka) cost about Rs 39000/= per month. This figure was calculated according to the data collected from Ingiriya EAM Malibon Garments factory, Sri Lanka.

- This new Anaerobic Filter waste water treatment system eliminates the problems of periodical maintenance of aeration machines and pumps which are necessary with conventional wastewater treatment systems

- Considerable amount of biogas can be obtained from the system and this biogas would utilize for thermal requirements of the factory.

2. International Research Papers present, on this novel Waste & wastewater treatment system

- World Renewable Energy Congress IX, Florence, Italy.
– August 2006
- International Conference on Knowledge Management for Sustainable Development –
Kathmandu, Nepal
- December 2009
- World Renewable Energy Regional Congress - Jakarta, Indonesia.
- April 2005

Please elaborate on potential and applicability of this new Biogas technology in our Region



Fig. 1

Due to the above achievement I was honoured by Minister of Environment & Minister of Agriculture with the "National Award for Green Jobs" in the category "Water resource management" at a competition conducted by the Ministry of Environment, Sri Lanka, on International Environmental day, 2009.



Fig. 2

Wastewater treatment system (according to Anaerobic filter technology UAFF) of Rockland distilleries ltd. - Marawila distillery, Sri Lanka

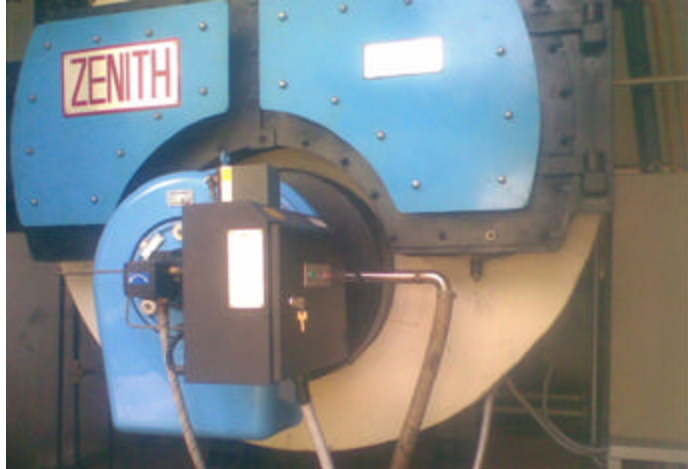


Fig. 3
Distillery boiler operating with biogas
fuel. - Rockland distilleries ltd,
Marawila distillery, Sri Lanka



Fig. 2
Wastewater treatment system (according to Anaerobic filter technology UAFF) of
Sri Lanka Distilleries ltd. - Wadduwa distillery, Sri Lanka