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High rate biomethanation power generation, BIMA technology,one solution for environment protection and river water resource restoration in India.

KEYWORDS: BIMA technology, SWOT analysis, Waste water treatment, Environment Management, Energy generation.

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ABSTRACT *High rate biomethanation power generation, BIMA technology can be one technology one solution for river water restoration, waste management, environmental protection, assessment and role of scientific technology to put cap on GHG emissions and waste to energy generation in Delhi, India. This study reveals SWOT analysis for resolving the organization deficiency. This study also represents sewerage parameters as indicators for pollution discharge and highly supportive in resolving environmental pollution issues.*

Yamuna is a prominent water resource in India and it stretches over 1370 Km in northern India. Along downstream it stretches only 22 Km in Delhi whereas suffers 70% of pollution load there. For river water pollution control in Delhi an action plan was implemented called Yamuna Action Plan in different phases [1]. During Yamuna Action Phase-I (YAP-I) in order to achieve clean Yamuna objective various components was identified. Government of India and Delhi Government had realized that all the important polluting sources should to be addressed simultaneously. Sewage, which is a major source of pollution, was tackled separately; however, other sources of pollution like industries, dairy farms waste, washing/bathing activities, crematoria's ash disposal etc. significantly contribute for pollution load. A comprehensive study was carried out by Municipal Corporation of Delhi (MCD) to identify and quantify the dairy waste generated and discharge in Yamuna, in Delhi, in YAP –II [2]. The observations indicated that the dairy waste is a significant source of pollution of the Yamuna and urge for its management is realized.

Although dairying as business contributes significantly in GDP of India, and its role is most important in supplementing food and nutrition. But existence in urban environment brings lot of negative impact on health and sanitation. In Delhi, India there exist a number of authorized and unauthorized dairy units. These dairies generate high quantity of solid liquid and gaseous waste and lack of management of the waste generated from dairy activities, is causing serious environmental consequences. The sanitary and hygiene conditions in both authorized and unauthorized dairies sectors in Delhi is extremely poor, as the dairy owners has little concern for the situation. Approximately 1170 tons of cattle dung generated from all authorized dairy farms is flushed along with dairy waste water in nearby urban water bodies which finally opens into the Yamuna River [2]. The biological analysis conducted for water discharged from dairy farms is tabulated in Table 1 shows the stake of explosiveness of the situation.

The major problems from dairy activities can be addressed as

- Discharge of waste water in water bodies without treatment and ground water table depletion due to high consumption of water for flushing of waste.
- High methane emissions and environment pollution by dumping of animal waste in surroundings.
- Unorganized Institutional structure of stakeholders and lack of management
- Lack of motivation in dairy stakeholders, financial resources and waste management plan.
- Inadequate infrastructure of dairy farm and overcrowding of animals in dairy sheds.

SWOT analysis done by us for these dairy stakeholders and dairy sector depicts;

Strength: The centralized human resource machinery is fashioned in a simplified hierarchy and there is no overlapping of duties. They have a well defined chain of command and trained work force to execute technologies and equipments for swift functioning.

Weakness: The use of advance technologies for practicing was lacking. Red tapism delays in functioning and there is no participatory policy formulation and implementation. Lack of updated procurement system.

Opportunities: The stakeholders can coordinate with NGOs/voluntary organisations to ease out the work. They can also collaborate with private partners for updating work methods, acquiring managerial and professional skills with government support.

Threats: The lack of coordination among the dairy owners/ groups and government and because of traditional work style and status-quo tendency their role can be transferred or hijacked by new agencies.

Therefore we had concluded that strengthening of institutional organization for dairy operation and maintenance is of prime importance. However, the focus of all efforts and initiatives shall be for the betterment of environment and use of technology for waste management, energy generation and sustainability of the dairy operation.

Ironically, one solution for all problems is technology implementation for waste treatment and its conversion into energy. High rate biomethanation power generation plant installation for waste to energy generation can be a feasible approach for waste treatment. The success models of such biogas induced mixing arrangement (BIMA) technology had been already established in India [3]. Simultaneously, waste minimization can reduce the flushing activities and save ground water and electric energy. The wastewater can be discharged after tertiary treatment in water bodies. Therefore Municipal Corporation of Delhi, Delhi Devel-

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opment Authority, Delhi Jal Board, Delhi Pollution Control Committee, Project Management Consultants and Dairy association representatives should coordinate and act aggressively for implementation of dairy farm waste management plan.

In nutshell dynamic attempts shall be initiated to solve various emerging predicaments in dairy areas. These attempts shall encompass all stakeholders, while for dairy operators enhancement of their literacy level, sensitizing them towards their rights and responsibilities, awareness of running policies and programs, creation of a positive ambience and attitude for developmental activities is required. Moral- ethical, skills (with new patterns) and reorientation training for MCD functionaries to collaborate with emerging partners and creation of new frameworks as recommended (Information Dissemination Cell, IDC Model) [4] is of great importance.

In our view the Indian Ministry of Environment and Forests (MoEF) may consider promulgating rule under Section 3 of Environment (Protection) Act, 1986 to regulate dairy waste in the similar line as biomedical waste or hazardous waste. The central/state pollution control boards must take legal measures strictly against the defaulting stakeholders causing environmental pollution under acts i.e. water pollution act (prevention and control of water pollution, 1974), Air Pollution Act (Prevention and control of air pollution, (1981), Environmental protection Act, 1986, National Environmental tribunal act (1995) [5].The offenders should be strictly fined/tipped or punished.

The waste discharge and disposal from dairying activities have strong local and global environmental impacts by GHG emissions. Besides that 1170 tons/day of animal waste generated from them technically have 32034 m^3 (approx.) of biogas generation potential [4] which can produce electricity of approx. 3.7 MW (Table 1) by following waste to energy generation success models [3]. This can certainly contribute to the sustainance of environment and Delhi dairying (approx $100 million, turnover) business.

Table.1.Gives the biological characteristics of dairy farm waste water from different dairy farms and dairy unit

Parameters	Result analysis											
	Shahdara South Zone- Dairy Farms		Civil Lines Zone-Dairy Farms		Rohini Zone-Dairy Farm	Central Zone Dairy Farm	Nazafgarh Zone- Dairy Farms				Nazafgarh Zone Unauthorized Dairy Units	
	Gazipur	Gharoli	Bhalswa	Jharoda	Shahbad Daulatpur	Madanpur Khadar	Masood-pur	Goela	Nangli	Kakrola	Raja Park	Harijan Basti
PH	7.04	7.12	7.34	7.11	7.32	8.34	7.18	7.58	7.07	7.07	6.68	6.86
Total Suspended solids (mg/l)	3420	436	620	2480	290	780	2280	340	4260	1890	19400	2700
Total Dissolved solids (mg/l)	2992	1908	2500	3400	3200	3760	3500	2210	4952	5560	8500	2800
COD (mg/l)	9265.2	4612.2	1283.5	1944.8	238	2489.8	5142.8	739.1	3449.4	4408.1	14284.9	2123.4
BOD (mg/l)[3 days at 27°C]	4170	2070	490	740	90	1040	2300	280	1560	1980	6400	890
Mass BOD load (Ton/day)	19.2	22.2	0.53	0.68	.013	4.97	3.28	0.85	5.6	2.01	0.1	0.01
Chloride (mg/l)	520.3	394.2	639.8	1119.6	839.7	985.5	591.3	699.8	1576.8	2034.1	1169.8	974.8
Color, Hazen units	6484	1050	1130	1490	40	3590.4	15718.1	2010	4420	2620	24600	4300
Ammonic Nitrogen (mg/l)	199.3	276.8	109.1	61.9	71.26	264.3	210.3	77.05	160.3	176.5	157.03	76.23
Total Nitrogen (mg/l)	382.3	425.22	125.94	198.32	91.85	309.5	417.87	83.96	304	212.1	516.6	256.9
Oil & Grease (mg/l)	108	78	25	39	36	56	90	28	52	64	18	8
Sodium (Na) mg/l	146	130	451	825	775	306	141	387	453	497	253	255
Temperature (°C)	21.2	20.4	32.2	30.2	32.4	21.4	21.5	30.1	21.1	21.1	31.3	31.5
Turbidity (NTU)	615	145	48	29	50	2460	1160	56	1440	1010	6890	760
Coliforms (MPN in100 ml)	39500	22700	5000	100000	750000	1900	1700	16000	63100	1700	900000	110000

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