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EVALUATION OF THE ANAEROBIC IMMOBILIZED GROWTH DIGESTER IN THE RIBBED SMOKED SHEET PROCESSING CENTRE

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ABSTRACT

Two anaerobic immobilized growth digesters having 15 m^3 capacity and aerobic pond which were serially connected in RSS group processing centre were evaluated. Effluent was fed daily at the rate of 1500 l, keeping a hydraulic retention time (HRT) of 20 days. The effluent samples were collected and analysed for various pollution parameters. Monthly gas generation was also monitored. Considerable reduction in various pollution parameters was noted at various levels of treatment. The BOD and COD levels reached near to the level prescribed for irrigation. The per cent removal efficiency was also high in both the treatment system. The biogas generated was burnt in the smoke house for drying of sheets and the temperature build up was compared with the conventional fire wood burning. Due to the initial burning of biogas for the first four hours and then burning of 75% of the recommended quantity of firewood, maximum temperature of 60°C and an average of 51°C were obtained. The sheets produced by this process was confined to RSS 1 grade.

INTRODUCTION

During the processing of natural rubber latex into Ribbed Smoked Sheets (RSS) grades, substantial quantity of liquid effluent is being generated. The daily production of RSS from a group processing centre would be in the range of 250-500 kg, which accounts of 1000 to 2000 l of effluent/day. Hence the effluent discharge from such centres creates environmental problems. Being organic in nature, this could be digested anaerobically leading to the production of methane gas, which is used as a fuel in the smoke houses for the drying of sheets (Ibrahim *et al.*, 1986). Mathew *et al.*, (2000a) have reported that biologically inert materials like polythene mesh in the anaerobic digester increases the surface area for microorganisms to act, which could there by reduce the pollution and increase biogas production. Hence a study was initiated to evaluate the performance of the anaerobic digester with biologically inert materials, termed as anaerobic immobilised growth digester, at RSS processing centre.

MATERIALS AND METHODS

Two Khadhi Village Industries Commission model floating dome type anaerobic digesters having 15 m^3 water holding capacity were used for this study. Each digester was fitted with 24 films (polythene mesh) with total area of 16.8 m^2. The reactors were daily fed with 1500 l effluent semi continuously. The hydraulic retention time (HRT) in the anaerobic immobilized growth digester under study was maintained at 20 days instead of the 30 days in the conventional anaerobic digester. The effluent coming out of the digester is mixed with wash water and is taken to an aerobic pond of 6 x 3 m size kept for four days (HRT) at an operating depth of 60 cm. Effluent samples were collected from various points and analysed for various pollution parameters as per the standard methods. Monthly gas generation was monitored. The gas generated was burnt in the smoke house using a specially designed heating hood having 60 x 60 x 30 cm size with 3.5 mm thick MS sheet over which protection was given with a wire mesh.

Temperature build up at various intervals due to combined burning of biogas with 187.5 kg (75% of the recommended quantity) conventional fire wood was compared. The quality of the sheets produced was assessed visually as per the guide lines in the green book (Anonymous, 1979).

RESULTS AND DISCUSSION

The effluent from RSS processing could be treated anaerobically (Mathew, *et al.*, 2000b). Considerable reduction in various pollution parameters was noted (Table 1). The BOD and COD level reached near to the level prescribed for irrigation. There was an increase in pH from 5.5 to 7.3 due to the anaerobic digestion. The pollution removal efficiency was high in both the treatment systems with reduction in HRT to 20 days. The appreciable reduction in various parameters might be due to the enhanced microbial activity, which could be due to the polythene mesh serving as a support medium for the microorganisms (Mathew, *et al.*, 2000a). A monthly average of 17.36 m^3 gas was generated from both aerobic and anaerobic digesters (Fig. 1). However, the maximum gas production was obtained during November and December which could be attributed to the addition of cow dung as seed material in the digester. The reduced gas production during February is due to the less quantity of the effluent fed to the digester consequent to the reduction in RSS processing.

Table 1. Effluent characteristics

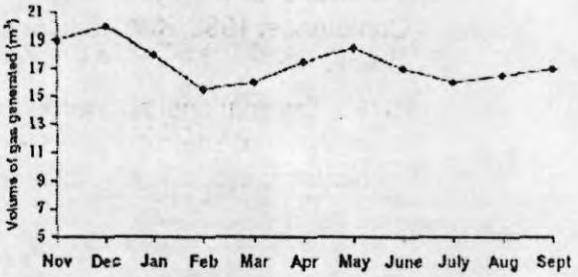
Parameter*	Effluent type		
	Raw	Anaerobic	Aerobic (4 days HRT)
pH	5.5	7.3	7.3
ITS	2480	845	460
SS	445	260	120
BOD	2940	285	125
COD	5165	915	238
Nitrogen	435	85	45

* All values except pH are in mg/L

A temperature build up of 50°C was attained at the 4th hour of burning of biogas and average of 39°C was attained (Fig. 2). Where as in case of burning of firewood a temperature build up of 55°C was attained at the 4th h. of burning and an average of 45°C was maintained (Fig.2).

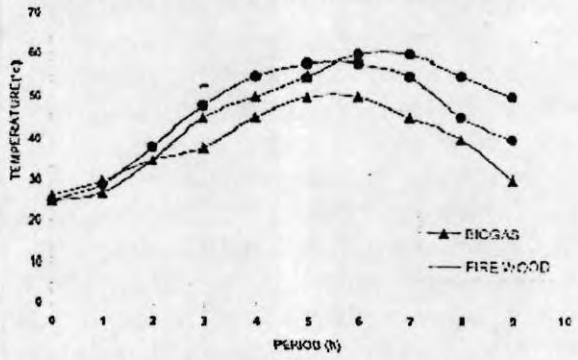
However due to the initial burning of biogas for the first 4 h and then the burning of 75% of the recommended quantity of fire wood, a maximum temperature of 60°C and an average of 51°C were obtained (Fig.2). The sheets produced by this process was confined to RSS 1 grade.

Fig. 1. Gas generation (Monthly)



The study revealed that anaerobic immobilised growth digester could reduce the pollution due to RSS effluent at reduced HRT. The biogas generated during this process could effectively be used in the smoke house and the heat build up is comparable to that of the conventional firewood burning. The combined use of biogas and firewood in the smoke house could give a uniform maintenance of temperature which will ultimately reduce the cost of firewood. Good quality sheets could be made by combined use of biogas and firewood burning.

Fig. 2. Heat Build up in the smoke house



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