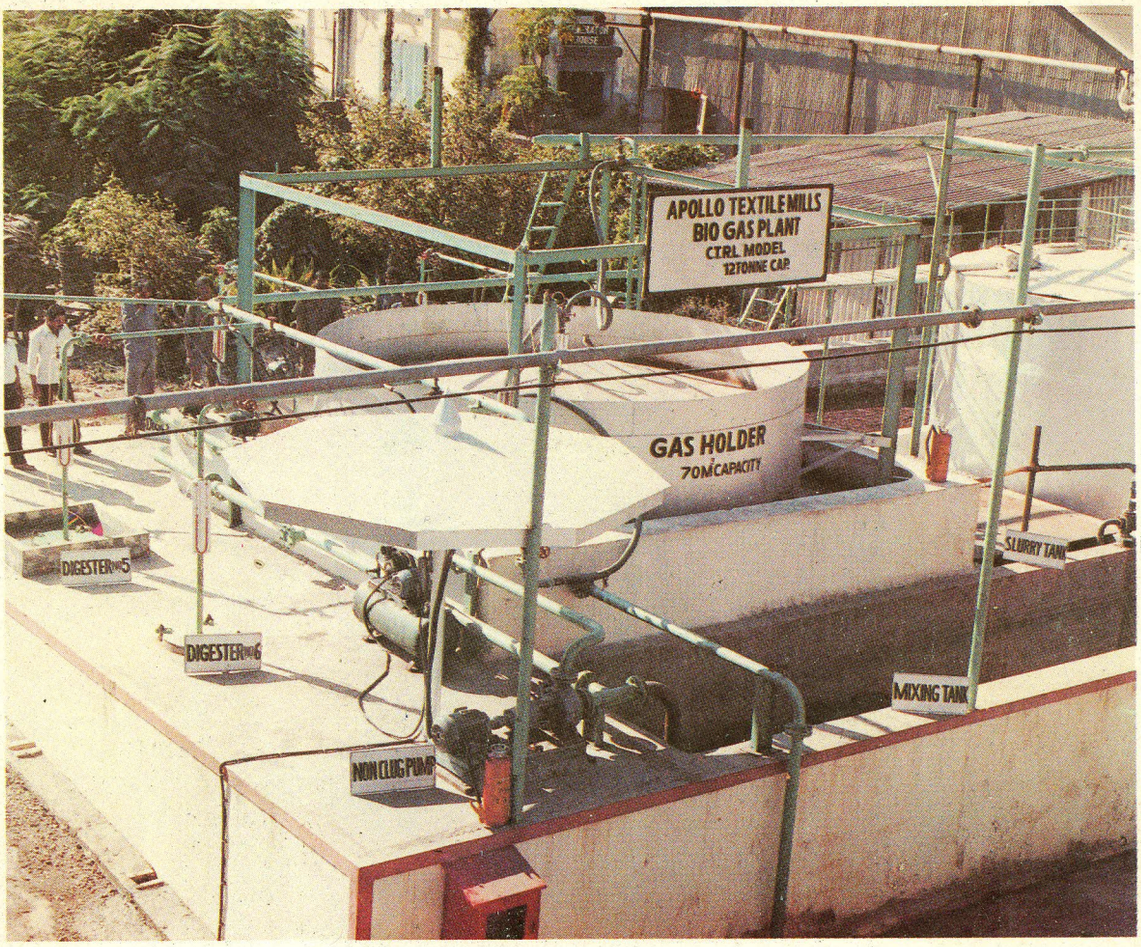

BIOGAS FROM SOLID CELLULOSIC TEXTILE MILL WASTE (WILLOW-DUST)

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INTRODUCTION

Textile mills in India consume about 100 lakh bales of cotton annually. The ginned and baled cotton received by mills contains impurities, like bits of seed coats, pieces of locules, leaf bits, etc. These impurities are removed during the blow room and carding processes in the mills. A considerable amount of useful short fibres are also removed during the cleaning process. Many mills recover these useful fibres by passing through willow machines; the residue left over is called willow-dust. It is estimated that about 40,000 tons of willow-dust are generated annually in the Indian textile mills.

As willow-dust is voluminous, storing becomes a problem besides creating pollution.

With a view to open up new vistas for better utilisation of this waste material, Central Institute for Research on Cotton Technology (CIRCOT) had conducted trials on the anaerobic digestion of willow-dust for the past ten years and developed a novel method to produce biogas and biomanure. The biogas plant based on this technology has been commissioned in Apollo Mills (one of the textile mills under National Textile Corporation). This plant is functioning well and the biogas produced is being used for singeing and in the mill canteen. A further improvement in the earlier process of producing biogas from willow-dust has been made during recent years to get biogas and readily usable biomanure more economically.

PROCESS

The new process is so simple that semi-skilled or even unskilled persons can operate the plant. The process involves mixing of willow-dust with dilute alkaline solution, lime and inoculum and stacking in open for aerobic (presence of air) fermentation followed by anaerobic fermentation in air-tight digesters. The biogas produced has 60% methane content and the material left after gas production (biomanure) has enriched nutrients (five tons of biomanure is equivalent to 10 tons of farm yard manure or 80 : 40 : 40, N, P & K per hectare).

DESIGN OF A TYPICAL DRY ANAEROBIC BATCH FERMENTER

The plant which is designed to process about 150 tonnes of willow-dust annually has the following features :

(i) Total Area	--	7.5 x 7.5m
(ii) Total Capacity	--	30 tons
(iii) R.C.C. Digesters	--	3 nos. 22.5m^3 each (2.5m x 2.5m x 3.6m)
(iv) Gas Holders	--	2 nos. 22m^3 capacity each (2.4m dia x 3.5m ht)
(v) Biogas Production	--	2500m^3/batch (15 batches)
(vi) Biomanure obtained	--	5 tons/batch (15 batches)
(vii) Capital Cost	--	Rs. 3 lakhs (based on the latest market rates plus 15% as fluctuation in prices excluding land cost)
(viii) Running Cost	--	Rs. 53,000/year
(ix) Total Income (Gas + Manure)	--	Rs. 75,000/-
(x) Net Income	--	Rs. 22,000/- per year

This technology based on dry fermentation of solid cellulosic waste, has the advantage of less water requirement, more fermentable matter in the unit space and ample scope for producing biogas in an economically viable plant design.

EFFECT OF APPLICATION OF SPENT SLURRY (BIOMANURE) ON COTTON

F -- *Plant grown on soil amended with normal dose of N, P & K*
C -- *Control (no manure and no fertiliser added)*
M -- *Plants on soil amended with slurry from biogas plant.*

The biogas produced can be used in textile mills for singeing, wet processing operations requiring hot water, in canteen or in staff quarters in the mill premises. The manure can be sold for agricultural purposes.