

Commercial Aspects of Bagasse, Procurement Storage, and Fuel Substitution Problems

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The steady growth of the sugar industry in our country in recent times, will convince any student of the ample availability of sugarcane bagasse which can be harnessed as an industrial raw material for paper. The number of Sugar Mills in our Country in 1970 will be between 200 and 225. On an average, 30% of the total sugarcane produced is being employed by the sugar industry for cane crushing. In 1969-70 the total quality of sugarcane crushed was in the neighbourhood of 49,266,600 tonnes. Needless to add that, during the IV Five Year Plan, sugar consumption is at the rate of 7 kgs. per capita in this country as against 40 kgs. in U.K. and 50 kgs. in the U.S.

Assuming that the quantity of cane crushed for the present is 50 million tons, it is safe to assume that 12.5% namely 6 million tons, of bone dry bagasse can be obtained before removing pith. At a ratio of 3 tons of bone dry bagasse for one ton of paper pulp, the above production of bone dry bagasse would mean production of 2 million tons of paper pulp. In other words, the above figures, taken on the basis of production of sugar cane bagasse in 69-70, clearly establish that we have adequate material of bagasse for making even 2 million tons of paper which would be much more than the target set for the IV Five Year Plan. It follows, therefore, that there need be no further argument as to why we should harness sugarcane bagasse as raw material for making paper pulp.

SUPPLY OF SUGARCANE BAGASSE BY SUGAR INDUSTRY:

The question now arises as to why the sugar industry should supply sugarcane

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bagasse to the paper industry instead of continuing to use the by-product as fuel as hitherto. What, it may be asked, is the incentive for the sugar industry to agree not to employ any long bagasse as fuel but supply it instead as raw material for the paper industry? The obvious reason that suggests itself to one is the overwhelming national interest involved. But it will be very legitimate for the sugar industry to raise the question as to why they should forego the fuel that they themselves produce and be called upon to depend upon other alternate fuels such as, coal or furnace oil, the supply of which is neither economical, nor regular and certain. Another immediate problem that will confront the sugar industry is that of converting their existing boilers or their replacement. Who is to bear the capital cost involved in so converting the existing boilers or in replacing them? Who is to undertake and guarantee fulfilment of that undertaking to arrange alternate sources of fuel to the sugar industry? The obvious answer is: "the Paper Industry". But, then, how is the paper industry more competent than the sugar industry to assure supply of coal to the sugar industry, assuming that the paper industry accepts to bear the capital expenditure involved in converting the existing boilers or replacing them by new boilers? Will it be economical for the paper industry to undertake both the capital expenditure and also the responsibility for uninterrupted supply of substitute fuel such as coal, lignite or furnace oil as the case may be?

These are very difficult questions to answer and by no means easy of solution. In the context of the ever-increasing bottleneck in the rail-road transport, it will be hazardous for the paper industry to undertake supply of coal as substitute fuel, particularly in the regions far removed from centres where

coal is mined. Also coal fired boilers are four times costlier than oil fired boilers. The sugar industry will readily insist that, if supply of coal as substitute fuel fails, they should be free to resort to use of sugarcane bagasse as fuel.

This would mean that their boilers in the sugar industry should be capable of being operated on more than one fuel and this immediately puts up the capital cost of installing such a boiler while at the same time inevitably reducing its efficiency as compared to a boiler operated on one fuel. The alternative would be that the sugar industry must have the luxury of having their present boilers operated on bagasse and in addition require the paper industry to supply them new boilers which are operated either on coal or furnace oil so that they will operate on the new boilers as long as substitute fuel is available and they may switch over to their original boilers in case they have to resort to burn sugarcane bagasse as fuel.

Above all, the sugar industry may add a further poser as to what is the gain to them in terms of round rupees if they are to agree to hand over bagasse to the paper industry and operate on other fuel.

Having raised the aforesaid problems, it must be stated that if this country should attain the target it has set for itself of producing 12,00,000 tons of paper during the Fourth Five Year Plan period, the paper industry must inevitably come to an understanding or arrangement at once reasonable and fair to both sides to ensure that sugarcane bagasse is not burnt as smoke but shall be employed as a very valuable industrial raw material. Once this approach is conceded, the problem of economics must be capable of solution, albeit a little difficult.

Taking the twin problems of capital and recurring expenditure involved, it is obvious that the paper industry must undertake the financial responsibility for the conversion of the existing boilers or for supply of new boilers which will operate on fuel other than bagasse. It goes without saying that the paper industry should meet and defray the cost of supply of the substitute fuel to the sugar industry for exchange of all the bagasse produced by the sugar industry. May be many paper mills do not want to invest in a venture to use bagasse as some paper mills have tried and almost failed due to economic reasons. The Government is very undependable and they keep on increasing excise duty every year on fuel oil and an industry cannot bare itself on such a steeply year to year rising costs of their principal raw material.

There are a few other factors which also must be borne in mind in determining the formula and the most important of them are (a) the percentage of boiler efficiency that is achieved in employing different types of fuel (b) the difference in the strength of labour force to be employed by the sugar industry in the boiler and conveyor section while operating on different fuels and (c) the saving in the handling of different fuels and above all, a realistic determination of the total quantity of steam required by the sugar industry to convert the cane juice into crystal sugar. Formidable though these factors seem, it should not be difficult for the parties to reach a reasonable agreement in order to achieve the National target of producing 12,00,000 tons of paper before the expiry of the IVth Plan period.

Once the total steam requirement of the sugar industry is realistically determined, it should not be difficult to arrive at a formula as to how many tons of different types of fuels as the case may would be required to replace bagasse.

To take coal as substitute fuel, I can best quote from the calculation arrived at by the author of the article captioned 'Bagasse for Paper Making' published in the INDIAN PULP AND PAPER, Vol. VIII No. 6 December, 1953 (Page 295).

Assuming that bagasse with 45% moisture content has a calorific value of

4500 B.T.U. per lb. reaching a boiler efficiency of only 55%, when the moisture is reduced to 12%, its calorific value comes to 7300 and the boiler efficiency increases to 67%. Comparing this with coal assuming a B.T.U. of 11500 and the boiler efficiency at 78%, it would mean that one ton of coal can replace 3.6 tons of bagasse burnt wet or 2.5 tons of bagasse bone dry, meaning 5 to 12% moisture. In other words, it would mean that for every ton of coal supplied by the paper industry the sugar industry must agree to release 2.2 tons of bone dry bagasse.

If, however, in view of the very difficult position regarding supply of coal, particularly in the distant South, the paper industry is unable to undertake supply of coal, then, assuming the B.T.U. of furnace oil as 18000 and a boiler efficiency at not less than 80%, one ton of furnace oil should liberate not less than 3.5 tons of bone dry bagasse. (The author's own calculation differs from the above which is quoted only as an illustration to make the point that it is necessary to establish a pattern or ratio between the fuels on the basis of their B.T.U.).

It will, however, be seen that if furnace oil has to be supplied as substitute fuel, the cost of bagasse becomes prohibitive for the paper industry and this calls immediately for rebate on the duty on furnace oil or the entire abolition of it.

Cost of B.D. Bagasse should be around ...

Rs. 130/Tonne

Cost of Partial Depithing Sugar Mill

Power Cost	Rs. 6.00
Baling Wires	Rs. 6.50
Stores Issues	Rs. 2.50
Salaries & Wages	Rs. 18.00
Transport for 40 miles	Rs. 25.00
Unloading and Stacking	Rs. 3.75
Sales Tax	Rs. 2.40
TOTAL	Rs. 64.15

B.D. Tonne of partially
Depithed Bagasse

—do— —do—
—do— —do—
—do— —do—
—do— —do—

tonne

Fuel cost should be assuming a ratio :
1 ton fuel oil = 3 Tons. B. D. partially)
Depithed bagasse)

$$130 - 64.15 = 65.85 \times 3$$

$$= \text{Rs. } 197.55 \text{ only.}$$

Only by such rebate on excise duty can the above proposition be rendered economical and it will then be worthwhile for the paper industry to consider supply of furnace oil to sugar industry for

liberating bagasse for use as raw material for making paper. Paper is a national requirement. There is serious shortage of both cultural and industrial papers. So paper must be treated on the analogy of food grains. During lean years Government practically subsidised food imports to keep the country going. Similarly Government has to subsidise the fuel oil and keep it at an economic level so that the ultimate price of bagasse can be comparable to Bamboo.

PROBLEMS WITH USING FUEL OIL FOR EXCHANGE WITH BAGASSE :

I. Price :

In 1961 the price of Furnace oil at destination was Rs. 155.65/ton. Today with the progressive of increase in excise duty, the withdrawal of freight structure concessions and enhancement of the railway freight structure the ex-destination price has advanced to which stands at Rs. 245/- tons. This one factor alone has increased the cost of bagasse from Rs. 62.26 to Rs. 98.26 per tonne and added to Rs. 90/- per tonne of pulp.

I venture to make the following suggestion for this conference to consider for making bagasse pulping in our Country economic and feasible.

WHAT SHOULD BE THE COST OF FUEL OIL IF BAGASSE IS TO COST AT PAR WITH BAMBOO

Any cost higher than this will make bagasse not worthwhile using.

SUGGESTION 1 :—

Mr.P. Honig, Chairman of International

Society of Sugarcane Technologists (Isocate) in 1950 has stated that it has been found possible for a raw Sugar Mill to provide its factory power and steam from only 8% fibre on cane. The amount of fibre may vary from 11 to 17%, the amount of surplus therefore theoretically available from 3 to 9%. If an average figure of 13% is taken it means a surplus of 5% fibre on cane. This means $49266600 \times 5/100 = 2436330$ (Tonnes of Bagasse B.D.).

Sugar Companies with a few exceptions have had no interest in making the maximum surplus available now in upgrading the bagasse and converting it to other products. On the other hand industries purchasing bagasse have had little knowledge of the problem of the Sugar Industry and were only interested in obtaining a stable source of raw material at as low a price as possible. Experience in successful utilisation of bagasse has shown that this loose buyer-seller interest must be strengthened by closer association and then only it will be possible for getting surplus bagasse for paper industry.

HOW SUGAR MILLS CAN RELEASE MORE SURPLUS BAGASSE FOR PAPER INDUSTRY.

A. Savings in Steam generation conditions :—

- 1) Adoption of measures for improved control and regulation of combustion (CO_2 indication, draft gauges and controls soot blowers etc.)
- 2) Insulation of boiler and main steam line distribution system.
- 3) Insulation of main return condensate system and feed water tanks.
- 4) Adoption of measures for minimising boiler scale formation (Water treatment, blow down control etc.)

B. Modernisation of Steam generation conditions :—

1. Adoption of improved types of furnaces and stocking practices.
2. Installation of air pre-heaters.
3. Installation of economisers.
4. Installation of superheater.

C. Savings in Steam Usage:—

1. Insulation of different secondary distribution systems, process equipment, tanks etc.,

2. Installation of steam traps wherever feasible.
3. Collection of all exhaust steam in a closed well insulated, back pressure system or circuit.
4. Collection of all hot water condensates in a closed well insulated return feed water system.

D. Modernisation in steam usage :—

1. Off bleeding of steam between effects for juice heating.

ping in and promulgate a bagasse control under similar to "Molasses Control Order" for all sugar factories crushing more than 1200 tonnes/day. — Just as Molasses are to be removed as per Government directive to distilleries in that region it should be made obligatory on Sugar Mills to supply the Surplus bagasse to Paper Mills.

WHEN THE GOVERNMENT ISSUING LICENCE TO SUGAR MILL — Should make this obligatory and binding on the Sugar Mills.

How the Cost of Rs. 15/- Tonne at Sugar mill is arrived at :—

Cost of 'Economic' B. D. Bagasse depithed at Paper Mill	...	Rs. 135.00
Hence cost of B.D. While Bagasse	$135 \times 85/100 =$	Rs. 114.75
50% —do— —do—	...	Rs. 57.37
Cost of handling	...	Rs. 5.00
Cost at Weigh Bridge	...	Rs. 52.37
Cost of Transport	...	Rs. 37.37 (for 100 miles)
Cost at Sugar Mills	...	Rs. 15.00 as is where is

2. Increasing the number of effects.
3. Circulation and flashing of condensates from the early effects into the subsequent effects.
4. Installation of thermo compressors.
5. Installation of steam accumulators against sudden demands.
6. Reduction of moisture content of bagasse by improved operation of discharge cane crushing rolls.

E. Changes in process operation conditions :—

1. Reduction of imbibition water.
2. Reduction of exhaustion of sugar from intermediate and final molasses.

Only release of surplus bagasse from sugar factories in a particular region to the paper mill nearby will solve the problem. The cost of bagasse should not exceed 15 Rs. — "as is where is" basis at Sugar Mills. This will cover baling charges and marginal profit for sugar mills.

The Government should consider step-

SUGGESTION II :

Though bagasse is obtained in exchange for furnace oil this constitute two independent transactions and sale tax is due on each of them. This has further added to the burden of cost and made the use of bagasse much less economic. Bagasse would be an economic substitute for bamboo or bagasse will be a supplementary raw materials only if paper mill is adjunct to sugar mill or vice versa — received its day to day requirement of bagasse directly from the sugar mills and bale only the surplus for use during the off season. We can save Rs. 35.00/Tonne this way by avoiding Transport cost. Cost of intermediate stacking and baling and avoiding losses.

High pressure boilers can then be set up to operate on coal. The centralisation of steam distribution will provide greater operational flexibility, bring about a better balanced utilisation. Both of steam and power then would be possible under the individual operation and lead to a substantial reduction in cost to the advantage of both the sugar and paper mills and conduce to a

more economic utilisation of bagasse which though a potential raw material of immense value now finds a use only as fuel and under the existing conditions, cannot find a remunerative use in any other force.

III. Even assuming that some formula is agreed to both by the sugar and Paper interests, all the attendant problems are by no means solved and questions such as erection charges for boilers, building to house boilers, feed water pump, transformer distribution system, calibration of instruments etc., etc., still remain to be solved. But, surely, given goodwill on both sides an equitable and mutually satisfactory solution can and must be found. Both the industries must arrive at a broad pattern

which can be applied with such minor variations as are necessary to suit the local conditions for establishing regular supply of bagasse by the sugar mills to the paper mills in the different parts of the country.

An alternate suggestion equally feasible will be worth consideration.

Having regard to the disbursement of the sugar mills in the various parts of the country and location of paper industry in other different parts of the country, it is absolutely essential that we locate a big sized PULP UNIT in the centre of sugar mills so as to produce paper pulp out of the sugar cane bagasse received from the neighbouring sugar mills and then distribute there from

the pulp so made to the paper industries within economic reach. Even here Sugar mills must be told by the Government to make surplus available bagasse to the Pulp mill. This seems to be the another realistic way to solve the acute shortage of raw material that the paper industry will be shortly confronted with. The importance and urgency of this problem cannot be overemphasized.

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