

# Bagasse - The Proven Raw Material for Manufacture of Newsprint

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India is the largest sugarcane producer in the world and Tamil Nadu is the third largest in India. Yet no large scale exploitation of the sugar processing waste viz, bagasse has ever been undertaken until the TNPL concept was mooted. Though the Government of India came out, as early as April 1975, with a notification conferring 100% exemption of excise duty on printing & writing papers made with 75% bagasse, it still did not provoke any large scale proposals for bagasse based pulp and paper mills. The Tamil Nadu Government, which has a well established Sugar Corporation owning a few sugar mills and which promotes new sugar mills in the Government Sector, felt that it can play the role of a pioneer in promoting large use of bagasse in the newsprint industry. This effort would also conserve the very meagre forest resources of the state while at the same time developing the pulp and paper industry within the state. And again, newsprint is a politically sensitive commodity whose prices are administered by the Government of India. Investment in this sector has generally been the task of the public sector as with the wood based newsprint mills in the neighbouring states of Karnataka and Kerala. A composite mill concept which permits production of both newsprint and printing & writing papers was selected by the Government of Tamil Nadu for its increased viability in view of the fiscal incentives offered by the Government of India for substantial utilization of bagasse in the printing & writing papers.

Crystalizing the concept into a project proposal capable of obtaining approval for loan assistance from Financial Institutions was a task entrusted to the Projects and Consultancy Division of M/s Seshasayee Paper and Boards Limited which has more recently restyled itself as M/s SPB Projects and Consultancy Limited. With their assistance, the TNPL project concept was worked out thread-bare and its pioneering role was

recognised by financing institutions in India as well as the world Bank. The project was, therefore, able to take-off after tying-up the requirement of funds with whole-hearted support from the Indian Financial Institutions lead by IDBI and the massive assistance of US Dollars 100,000,000 from the World Bank.

At this stage, the project had generated considerable speculation and controversy, in equal measures. The focal points of such speculation and controversy were briefly.

- Availability and choice of technology for manufacture of newsprint containing substantial amounts of bagasse in the furnish, viewed in the wake earlier unsuccessful ventures in Peru and Mexico.
- Non-usage of any imported long fibre reinforcement pulp
- Doubts regarding manufacture of mechanical bagasse pulp since it was then quite clear that a mechanical pulp content in the furnish is a technical requirement for good newsprint properties.
- Ability of the mill to be able to procure very large quantities of coal from long lead up-country pit heads and effectively manage the coal fired steam generation facilities introduced at five sugar mills to obtain release of bagasse
- Achieving a formidable 36-month project implementation target
- Technical feasibility of producing acceptable quality of writings & printings containing 75% bagasse pulp and 25% Indian hardwood pulp without the use of long fibre furnish and with expected levels of machine runnability at speeds around 600 mpm.

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— Chemical recovery of bagasse black liquor and pollution control hazards in a large sized bagasse based mill. I will now, briefly, share with you our approach to, and our experience of the above issues.

### Technology

When the investment decision was taken on this project, the technology for manufacture of newsprint from bagasse was not proven and there were at least two unsuccessful installations in Latin America. The third one in Argentina, which was in an advanced stage of implementation was also more or less from the same lines as the first two. Based on indepth study of the early failures, our project consultants developed modified concepts which involved proven equipment. Requirement of mechanical bagasse pulp in the furnish was then clearly identified as a per-requisite. After detailed discussions with various groups of suppliers, Beloit was identified as one large machinery manufacturing group capable of mobilising adequate research efforts to develop the idea of mechanical pulp based bagasse newsprint and develop the same into commercial application. Beloit was assisted by SPB-PC in its research effort which has resulted in the Beloit-SPB process for newsprint from bagasse.

While the TNPL project started production of newsprint in September 1984, almost on schedule, the final phases of system trials in the bagasse pulp mill were nearing optimization. The mill, therefore, commenced its initial production of newsprint with 100% imported pulp. For a large green-field project of its kind with newly developed technology, it was thought prudent not to attempt simultaneous start-up of all sections of the mill. The newsprint production on imported pulp along with start-up of all other utilities was considered in the first phase, which was completed in September 1984. Shortly, thereafter, the hardwood pulping line was commissioned and newsprint production continued with imported mechanical wood pulp but with hardwood pulp replacing imported long fibre chemical pulp. This was the second phase of mill start-up. As a third phase, the chemical bagasse pulping line was started-up in May 1985 and newsprint production was thereafter carried out with 50% imported mechanical wood pulp, 35% chemical bagasse pulp and 15% hardwood pulp. Simultaneously, the chemical recovery boiler and other units in chemical recovery section were also successfully commissioned.

As the fourth and final phase, the mechanical pulping line start-up operations were commenced in July 1985 and the quality of mechanical bagasse pulp was optimized for machine runnability in October 1985. Ever since, the mechanical pulping line has been operating for continuous periods but with breaks in between to attend to optimising details, plate-pattern evaluation, etc.

In the meantime, the paper machine which started-up at speeds of 500 mpm had gradually been increased up to 700 mpm. Writing and printing grades were also introduced in August 1985. The paper machine operations had therefore reached an advanced position on the learning curve. With a view to maintain profitability targets, it was imperative that the mill establish a minimum monthly production of atleast 6000 t of newsprint and 1500 t printings and writings. While writings and printings has been, from the start, consistently made with the target furnish of 85% chemical bagasse pulp and 15% chemical hardwood pulp, the high level of production of newsprint has called for use of make-up imported mechanical wood pulp to bridge the shortfall introduction of mechanical bagasse pulp. We at the mill are confident of moving up the learning curve with the mechanical pulping line to a point where the mill will be continuously producing newsprint with the target furnish and without any imported mechanical or chemical wood pulp.

### Elimination of Imported Long Fibre Chemical Pulp

Controversy was most rampant on TNPL's selection of a concept that assumes ability to make bagasse based newsprint without the use of any long fibre chemical pulp. There was also considerable speculations on the ability to make quality printings and writings using 75% chemical bagasse pulp and 15% chemical hardwood pulp without any long fibre support. Machine speeds of 600 mpm and above, were considered far fetched if long fibre support was not considered.

Mill experience at TNPL has proven beyond all reasonable doubts that with machine speeds of 600 mpm and above, no long fibre support is essential even when using a weak furnish or when having to establish quality standards comparable with the best that is produced in the country. It is time that we realised that the prime consideration in these matters is the ability to

design a good system with requisite level of instrumentation and controls besides selecting the most appropriate machine configuration. If more and more high speed machines are gradually introduced in the country the learning curve could well be shortened. Proof of this lies in the fact that TNPL is the beneficiary of operator experience at the other two high speed installations at the Kerala and Mysore newsprint mills.

### **Is mechanical bagasse pulping feasible ?**

The mechanical bagasse pulp, custom designed for TNPL, actually comprises a TMP fraction and a CMP fraction in almost equal parts. The TMP fraction provides the opacifying property which is a very sensitive characteristic of a newsprint sheet. The CMP fraction provides the strength component of the mechanical pulp which dictates machine runnability and, to a certain extent, the sheet properties.

The mill experience in the manufacture of such a mechanical bagasse pulp has established, beyond reasonable doubt, that the above pulping route of mechanical bagasse pulp is technically sound. Apart from the rigours of the learning curve in this area, we have to confront with a characteristic of bagasse that has nothing to do with pulping. Bagasse as a material poses an extremely difficult proposition for any effective material handling system. Right from the receipt of bagasse at the mill, its depithing, wet pile storage, reclaim, washing and preparation, pressing and other operations, bagasse presents chameleon characteristics and is extremely unpredictable. We have been continuously attending to very many minor details which were holding up stabilisation and optimisation of mechanical pulping lines on this account. We are, however, confident of fine tuning this area during the course of next couple of months.

### **Coal Procurement**

Apart from outside controversy and speculation, fuel procurement for this project was, indeed an area of concern to all of us in the project. Fuel procurement problems, however, are not uncommon and have been experienced by even industries that are located close to pit-heads. Organisation for coal procurement was therefore given very serious and early attention with the result that the project has till date not faced

any moment of anxiety on this account right from the mill start-up.

As a feature of the project concept, our consultants had very rightly recommended multifuel boilers which would incidentally also consume pith which would otherwise constitute the major solid waste disposal problem. These multifuel boilers were contracted with a capability to burn all grades of coal including very high ash content coal, carbonised lignite, raw lignite, coke and furnace oil besides pith.

The Multifuel Boilers have convincingly demonstrated their remarkable multifuel capability which has opened a totally new dimension to fuel management for large projects with high energy demand. It is my considered opinion that projects with a high demand of fuel may do well to consider the multifuel boiler concept. For instance, we have successfully utilised various wastes like rice husk, effluent treatment sludge etc. with reasonable ease and success.

Tamil Nadu, as a state, has a very good network of roads that are of "all-weather" type and are reasonably well maintained. Quite a few lorry fleet owners with a tremendous transporting capacity are Tamil Nadu based and some of them are close to the project site. The newsprint mill site constitutes a coal/fuel dump where we receive all fuels and timely distribution of coal with minimum stock levels at individual sugar mill offsites has never posed any serious problems. Pre-compacted as well as loose bagasse has already been transported without serious bottle-necks using conventional trucks and lorries and avoiding costly dedicated transportation methods used by bagasse based projects of this size elsewhere in the world.

### **Implementation Schedule**

The project implementation schedule originally targetted for 36 months was indeed accomplished, give and take a few days. This task was not achieved without its moments of sheer necessity and despair. An All India port strike materialised out of the blue at a very crucial stage of final shipment of critical items of plant and machinery. Notwithstanding this and very many other handicaps, the project implementation proceeded in an almost clock-work precision. This was, in my opinion, due to some excellent co-ordination between the company, the project consultants and all major and

minor suppliers of equipment and services. Departments of Governments, Central and State, lent a kind of support that had to be seen to be believed. The World Bank and the Indian Financial Institutions lead by IDBI showed a great depth of understanding and eagerness to assist the project in its endeavour for timely completion. A comprehensive project implementation procedure and clear lines of demarkation of responsibility linked with appropriate authority had been instituted right from the start. Modern project management techniques were also brought into use and a computer aided PERT network programme was used to monitor about 2500 essential activities.

The mill commenced production of writings and printings in August 1985. All grades made by the mill so far have been well received in the market and, in most characteristics, the papers are as good, if not better, than what the market has been used to. Extensive laboratory work is still on to determine end-user requirements in more quantifiable terms, especially the printers' needs. We are confident that, in the months to come, we will be able to add further dimensions to our quality assurance efforts.

The mill experience has demonstrated that almost the entire range of writings and printings required by the market today can be produced with a furnish of 75% bagasse pulp and 25% hardwood pulp at speeds around 600 mpm without any long fibre support. TNPL is perhaps today producing writings and printings out of 100% short fibre at the highest machine speeds ever recorded.

Perhaps the only handicap we face is due to the machine configuration and not so much furnish. The machine configuration having been chosen predominantly of newsprint at high speeds with a weak furnish, the tri-nip operating at high nip loads gives us a sheet that is too smooth even before the calenders that it is not rough enough, according to some, for superior duplicating paper.

The mill had initial problems with a market response calling for additional bulk in the sheet. But over the months our research effort in identifying the printer's requirement has been able to assist end-user applications

to more effectively use the lower bulk TNPL printings and writings. Briefly speaking, the TNPL sheet has a much lower ink demand which, if recognised and used to set up the printing press parameters, enables one to come out with a printed sheet which does not reflect the lower bulk or the lower opacity to the extent that one would imagine. An example of this principle is the successful use of TNPL's 47 gsm creamwove as telephone directory paper in the recent issue of Coimbatore and Bombay Telephones.

Among minor sources, more particularly the World Bank and Indian Financial Institutions, there was considerable apprehensions regarding viable operation of a chemical recovery unit which is substantially based on spent liquor from bagasse pulping. It is my considered opinion that the fact that there are some large bagasse based mills elsewhere in the world which do not have chemical recovery facilities has been on other consideration that have nothing to do with the technical feasibility recovery.

Notwithstanding the above project planning and selection of system and equipment for chemical recovery for TNPL was undertaken with that much more care. The result of meticulous effort in this area is a chemical recovery unit at TNPL which can stake its claim as the finest in the world, with a very high performance record and yet very simple and conventional in its basic and fundamental structure.

Pollution control, again, has been attempted on extremely conventional lines but with greater attention to details. Our only problem in this area mainly arises out of process dislocations attributable to the very difficult nature of bagasse as a material.

I have taken perhaps much more time though I tried to be brief. The entire TNPL project has been an exciting experience. Colleagues from our mill and from SPB-PC will, during the course of this seminar, be presenting more detailed papers on issues that I have very briefly touched upon.

In conclusion, I have no hesitation in stating that bagasse based newsprint is here to stay. I am equally confident that bagasse as a paper making raw material

