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**NEWSPRINT MANUFACTURE FROM BAGASSE
--- TIME FOR A SECOND LOOK**

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Abstract:

Newsprint manufacture from bagasse has been the subject of search and research for the last so many decades ever since 1856-57 and shortages of newsprint pushing the efforts up especially. In the 1950's there were concerted efforts/activities (during the Korean war) in Cuba and Louisiana but failed to produce the newsprint conforming to international standards. Various processes developed over the years were Dela Roza, Dr. Cusi and PEADCO etc. etc. During the newsprint shortages in 1973-74 the research and development activities led to the construction of full-scale projects in Peru (where INDUPERU, Trupal went on stream in 1978) and the success of which spurred the coming up of similar projects such as Sociedad Paramonga SA Ltd; Peru, Mexicana de Papel Periodico SA (MEXPAPE) Tres Valles, Veracruz, Mexico (started in 1979) and construction of UNDP financed pilot and demonstration plant in Cuba and coming up still of another mill Papel de Tucuman, La reduccion (Tucuman Province) Argentina in late 1983.

Various other processes available on the very scene are Hitachi Zosen, Japan, CE-Bauer, USA based on Chemi-thermo-mechanical pulp (CTMP) and ENSO Finland based on chemi mechanical pulp (CMP) and possibly some of the prospective entrepreneurs would be exploiting these in the years ahead.

The main fear, because of which some of the earlier attempts failed to succeed was the lower opacity and the strength governing the runnability at high speeds of 700-850 m/min. or even higher. Some in order to get over the problem of opacity used fillers and even so much so mechanical pulps such as Stone Groundwood (SGW), Refiner Mechanical Pulp (RMP) and Thermo Mechanical Pulp (TMP) have also been tried instead with successful results-upted opacity and reduced showthrough and even reduced basis weight.

Two newsprint mills bagasse-based P.N. Kertas Letjes Mills, Probolinggo, Indonesia and Tamil Nadu Newsprint/Paper, Pugalur, India which went on stream in 1985, are employing the mechanical pulping approach and based on very careful pilot plant and sustained demonstration runs and today their success can be attributed to these. Besides these mills the Cuba-9 group operating a complete and flexible bagasse newsprint pilot plant in Cuba has also been busy optimising the technology for bagasse newsprint manufacture and the results have been encouraging. The results obtained in very field in India and Indonesia should certainly serve as an eye opener to the world's various bagasse-rich countries, may be developing especially or the developed ones which are softwoodless or short but bagasse-rich with a view to either uptaking their newsprint production or putting up new newsprint units for avoiding recurring colossal drain of precious foreign exchange disturbing their balance of payments. Bagasse newsprint units/ventures should be more than welcome by the developed countries bagasse-rich as these will give relief to their slowgrowing, fast-depleting an over-taxed softwoods and pushing further the impending famine.crisis of raw materials predicted and feared around 2000-2010 A.D.

Integration of the old or the new sugar mills with the new-on-coming newsprint units should merit the attention of the new entrepreneurs in the bagasse-rich countries as this would be helpful and profitable for both, in the short and long run too.

The future would certainly see more of newsprint projects based on the work of ENSO Gutzeit (Finland), Hawaiian/Crown Zellerbach group, Seshasayee Paper Board/Beloit International Corporation and the CUBA-9 group and employing the mechanical pulping approach (maximum possible percentage of mechanical pulp-bagasse for reasons of not only opacity, better printability but also economy- i.e. lower costs in view of the zooming project costs), having good bagasse storage methods (for zooming project costs), having good bagasse storage methods (for avoiding brightness loss) and also employing the highly efficient depithing systems (for removing maximum possible of pith which is unwelcome in not only pulping but paper making too but can be safely and easily burnt in boilers).

Introduction:

Production of newsprint from bagasse with quality conforming to or near to woodpulp news print and acceptable to the publishers has been longtime 132 years oversince 1956-57 a cherished dream/goal of the various agencies/organisations, mills, consultants, researchers equipment/machinery manufacturers etc. world over. There were activities, efforts during these y ears and efforts getting pushed up/accelerated specially during the period of newsprint shortages.

Early efforts:

The first work on bagasse newsprint was done around 1856 by Mr. Henry Lowe Baltimore, Maryland, USA. He did experiments with sugarcane, made bagasse pulp and the paper was used to print the Baltimore Advocate.

Another claim/experiment was made in 1870 in ELKTON, in 1875 in Maryland and in 1884 in New Orleans. By 1908 Bert de Lamar established a bagasse pulp mill on the Isle of Trinidad and at least one issue of the Trinidad Mirror was published using bagasse newsprint.

The last 2-3 decades have witnessed various reports/studies on research done at pilot plant level and industrial/semi industrial scale runs such as Aschaffenburgur Zellstoff (Fed. Rep.), Crown zellerbach Sugar Planter's Association HAWZELL process) Karlstand Mekaniska Werkstad AB (KMW) Sweden, WR Grace Co. (Peadco USA), Procesos Technic Industriales SA (Cusi process) Mexico, Sunds Defibrator AB Sweden, CE-Bauer, USA, Hitachi Zosen, Japan, Enso Gutzeit oy Finland, ICIDCA/Cuban Research centre (Cuba-9), Beloit International Corp., UK/Beloit USA/ Seshasayee Paper Board consultancy (India).

Efforts for commercialisation:

There have been various efforts for commercialisation of he various processes such as:

1) de La Roza:

Joaquin de La Roza (A Cuban Engineer) set up in 1950's a bagasse based newsprint mill Technica cubana in the city of cardenas started late 1958, had a capacity of 100 tpd with the financial assistance from Batista Cuban Government utilised a Kraft cook preceded by pre-hydrolysis stage. The production costs were very high and the newsprint produced contained substantial quantities of celite, clay and also TiO₂ added to specially improve opacity and printability in turn with fillers as high as 30%. As the newsprint quality was not satisfactory and the costs prohibitive so the mill switched over to other grades such as writing, printing and bond papers containing high content of bagasse pulp. The author had corresponded with Mr de La Roza who had sent to me the mills brochure and newsprint samples and his article published in PPI, USA.

2) Valite Process:

Another mill 60 tpd capacity based on the valite process in 1950's was built in New Orleans, Louisiana, USA but met the same fate as that of de La Roza and utilised chemical bagasse pulp produced by a prehydrolysis stage and an alkaline cook. It also shifted to production of writing, printing grades.

3. Aschaffenburg-Zellstoff

Aschaffenburg-Zellstoff in 1954 had done lot of extensive trials on this process and used neutral sulfite semichemical process preceded by prehydrolysis for production of newsprint from bagasse but the paper produced using 90% semi chemical pulp and 10% long fibred pulp was not of a satisfactory quality. Aschaffenburg group finally abandoned its efforts for commercialising this process about mid 1960's. Mr. Schepp presented a paper on this process at the UN Conference in Buenos Aires in 1954. One newsprint project 60,000 tpy capacity based on this AZ process was to come up at Bodhan (Andhra Pradesh) in India in mid 1960's but did not materialise.

Simon Cusi Process:

The Simon-Cusi group had been busy for about 2.5-3 decades for production of newsprint from bagasse and basing that on use of a high percentage of semi-bleached semi-chemical pulp (bagasse) and semi bleached chemical pulp (bagasse) and semi bleached Kraft pulp (softwood). They also recommended some other furnishes containing mechanical pulp (wood) besides and other containing 95% semi-bleached high yield pulp, semi chemical (both from bagasse) and Kraft (semi bleached) and fillers/ opacifiers.

Full scale bagasse newsprint mills with a capacity of 110-120,000 tpy each were built up in Peru, Mexico and Argentina using either the cusi process or with some changes here and there incorporated after start up.

Two bagasse newsprint projects based on HAWZELL process which were to come up in 1963-66 did not materialise due to one reason or the other, were Newsprint mill at Kous Sugar Mill, Egypt and Newsprint Mill in Tamil Nadu, India with a capacity of 90,000 tpy.

Industrias del Peru (INDUPERU) Sociedad Paramonga and MEXPAPE:

Industrias del Peru (INDUPERU) world's first bagasse-based newsprint mill with a capacity of 110,000 tpy and costing U.S. \$ 120 million started in late 1978. It was based on a furnish of 90-95% Cusi bagasse pulp (semi chemical), 5-10% Kraft pulp (softwood) and clay and other additives. Later mechanical pulp (imported) about 10% was also added so as to improve the opacity, absorbency and printability.

Sociedad Paramonga SA Ltd., Trupal, Peru (Northern):

World's second bagasse based newsprint mill started in August 1978, has a production capacity of 120,000 tpy and was based on a similar furnish as INDUPERU.

Mexicana de Papel Periodico: Tres Valles, (Veracruz) Mexico:

World's third bagasse-based newsprint mill (MEXPAPE) started in Mexico in 1979 and has a capacity of 120,000 tpy. The goal was to produce 3 types of papers newsprint (52 gm²), school text book paper (60 g/m²) and rotogravure. The furnish included besides 70% of Cusi pulp (bagasse) 10% Kraft (semi-bleached), 20% mechanical pulp (wood) and clay as well.

Besides the Cusi process, it also incorporated some elements from the PEADCO process (W.R. Grace and Co.) and Kimberly Clark de Mexico bagasse pulp/paper mill at Orizaba. Early new processes were Valite Corporation, H.L. Horn and Chemicell and de la Roza and Aschaffenburg Zellstoff (AZ) and about the same only provisionally WR Grace Co.'s bagasse pulp and paper mill Paramonga, Peru supplied newsprint to peruvian newspapers, who admitted, however that although in some ways the paper was technically acceptable but had a poor opacity, affected printability and besides production was uneconomical.

Papel de Tucuman, San Miguel, La Reduccion, Argentina:

Papel de Tucuman, San Miguel, La Reduction, (Tucuman Province) Northern Argentina world's fourth newsprint mill bagasse based costing US \$ 340 million, having a capacity of 110,000 tpy went on stream in December 1982. It also uses Cusi process and in the furnish had 70-75% Cusi bagasse pulp. 5% Kraft (Long fibres) and 20% mechanical pulp (wood) and good quantities of clay so as to get reasonable quality newsprint which would be acceptable to publishers. According to the latest reports Tucuman is using 90% semimechanical pulp (bagasse) and 10% chemical pulp (softwood) makes newsprint (48.8 g/m²) and also 60-79 g/m² with high brightness. Newsprint is used for domestic consumption as well as for exporting to Brazil, Uruguay, Bolivia, Paraguay, Peru and Venezuela. In 4 years (since start up) it made 280,000 tons of newsprint.

The failure of the Tecnica Cubana and Valite in late fifties to produce newsprint economically and of a quality acceptable to the publishers and were based on prehydrolysis followed by chemical pulping. Besides the other mills in Peru, Mexico also using about 15-20% mechanical pulp and lots of clay and having also higher production costs, due to usage of higher percentages of chemical/semichemical and quality problem made the new mills/ researchers think in terms of going in for mechanical pulping of bagasse because of its cheapness and also the technical, very desirable

properties so as to get newsprint with necessary qualities. Such method of producing newsprint would be following the traditional concept of the wood pulp newsprint industry.

Various world organisations which have done pioneering work on mechanical pulping of bagasse for new print are:

CE-Bauer, Forest Research and Industries Development Commission of Philippines, Technical university of Norway, Hitachi Zosen/CE-Bauer, Enso Gutzeitoy, Finland, PEADCO (WR Grace Co.) and Societal Paramonga SA Peru.

ICIDCA- Cuban Research Centre for Sugarcane Bagasse Industrialisation:

The cuban sugarcane byproducts research institute (ICIDCA) established in 1963 has done commendable work on bagasse especially for newsprint and the project had been code named CUBA-9. It had reviewed all the available processes such as Cusi PEADCO and HAWZELL (activities terminated in 1966) and others but favoured HAWZELL involving mechanical pulping of bagasse. The project financed partially by UNDP inaugurated in May 1981, cost US \$20 million, has been operating on a continuous basis and made and experimented with pulps such MP, CMP, SCP, CP and dissolving etc. The plant is designed for a sustained production of about 25-30 tons of mechanical type pulp and upto 35 tons of newsprint. They have developed optimum formulation for bagasse newsprint for cuba and plans were there to develop a full scale bagasse newsprint in cuba based on the technology. the cuba facility is the finest research and development centre in the world for bagasse pulp and paper making. Their aim is to have newsprint from bagasse using maximum amount of bagasse pulp of some type and no fillers, additives as Dr. Atchison J.E. wrote to the author sometime back to which my reply was that bagasse newsprint without fillers is a distant dream and we have to wait for many many more years.

World's various on-coming Newsprint Projects:

1. Pakistan paper/Newsprint Project at Kamalia (Faisalabad) Punjab with a capacity of 66,000 tpy (writing/printing, newsprint) costing of Rs. 265.7 crores (\$ 154 million) starting up in 1990-91 Klockner Stadler Hurter, Montreal, Canada heading the consortium constructing the mill. Besides bagasse pulp it will use 10% imported long fibre.
2. Uttar Pradesh newsprint project, Hempur (Dist. Nainital) U.P. with a capacity of 89,000 tpy costing Rs. 276.7 crores, coming up in end 1992 and being put up by National Newsprint/Paper mills, Neapanagar (MP).

It shall be based on a newsprint furnish of 60% bagasse chemical pulp and 40% chemi mechanical pulp (eucalypt-plantation grown) which was mooted by Sunds Defibrator in 1982.

3. Newsprint project in Bihar, India.
4. Newsprint Project in Maharashtra, India.

Newsprint Properties — At a Glance:

- Good strength for not only break-free run at high speed paper machines but also at high speed printing presses with production of 40-50,000 copies/hour and upwards.
- High wet web strength for easy/facilitated transfer of the web from the wire to the press section.
- Good opacity for having no show-through and clean, neat printing-mechanical pulps have the higher possible opacity, (highest being for clay/fillers) semimechanical pulp lesser and the chemical pulps the least 74-75%
- Good absorbency -- Mechanical pulp gives the best absorbency as compared to semi chemical/chemical pulp.
- Smoothness and resiliency/compressibility provided by mechanical pulp by virtue of the higher bulk giving better printing quality.

Besides newsprint should have:

- Lowest possible cost
- Use least amount of imported raw material involving hard currency expenditure.

Mechanical pulp as known from the newsprint manufacturers long term experience provides the very key-use properties of newsprint which give newsprint not only the economies of scale but also the technical/much welcome desirable properties. Large scale trials by USDA in early fifties, tuxtepec in sixties and Sunds Defibrator in 1982 and KMW in mid sixties had amply indicated that bagasse chemical pulp could be admixed with mechanical pulp (wood) for making acceptable newsprint sheet but this would not be of much interest for developing countries with no or limited pulpwood stands. And in case mechanical pulp (wood) was used that shall have to be imported meaning foreign exchange expenditure and outside dependence.

P.N. Kertas Letjes (IV Mill), Indonesia:

P.N. Kertas Letjes (IV Mill) Probolinggo (East Java) Indonesia newsprint costing US \$ 270 million started in 1985 and was based on a furnish of 40-50% mechanical pulp (bagasse) 40% semi bleached chemical pulp (bagasse and rice straw) and 10-20% Kraft (semi bleached) imported.

PEADCO group (WR Grace CO) furnished the basic technology and contractor for the mill was Technip, France. The quality of newsprint has been reported to be acceptable to the Indonesia newspapers.

Tamil Nadu Newsprint/Paper:

Tamil Nadu Newsprint/Paper located at Pugalur (District Tiruchi, Tamil Nadu) India with a production capacity of 90,000 tpy (50,000 tons Newsprint + 40,000 tons writing/printing) costing Rs. 240 crores and world bank aided to the tune of US \$ 100 million started on May, 24, 1985 with its own pulps. It is based on a furnish of 50% mechanical pulp (bagasse) TMP-CMP (rejects/coarse fraction), 35% chemical pulp (bagasse) and 15% Kraft pulp (Eucalypt) and newsprint being made at speed of 680-720 m/min. on a Bel Baie II Beloit Walmsley, UK and Beloit Corp; Jones division U.S.A. provided the major equipment package and the basic engineering services. The bagasse pulping system consists of the Beloit high yield pulp process, Thermo mechanical pulping screening and mixing this fine stream with the coarse stream after treatment with chemicals NaOH and Na₂SO₃ with a view to getting higher opacity, light scattering coefficient and bulk. Bleaching is with H₂O₂ to a brightness of 45° ISO. According to the latest reports reaching here the mechanical pulping street has been beset with problems/headches from the very inception i.e. lower production, poor pulp quality, poor refiner plate life, higher and uneconomic production with the result that newsprint has been containing only **10-20% mechanical pulp** (bagasse) and **never 50% the design**. This has affected very much the economy/profitability of the company during the last about 4 years.

At the **International Semi nar on Bagasse Newsprint** held at Madras on April 6, 1986, the virtues/values of TNPL newsprint had been extolled very much. Besides Beloit Corporation U.S.A. also claims that TNPL is producing newsprint matching very well with world-class Scandinavian and North American newsprint. TNPL newsprint quality defects/shortcomings will come to surface when they start using 50% MP (bagasse) and which are masked very much or not apparent because of using costly imported softwood mechanical pulp.

Successful Bagasse Newsprint Manufacture.

Looking to the history of bagasse newsprint manufacture ever since Tecnica Cubana and others and the failures or the partial success and change over to other grades etc. etc. it would be highly desirable and a must too to consider all the pros and cons before going in for a new newsprint project. The various critical factors for successful newsprint production are:

- Good depithing system (moist and wet)
- Good wet bulk storage for preserving colour and strength properties of bagasse.
- Bagatax-20 process for storing bagasse has been developed in Brazil and could be of far-reaching effects in improving quality, avoiding bagasse deterioration even after 2 years storage, color, brightness and reducing cost and be of great interestd/ value to the new on-coming bagasse newsprint projects.
- Higher percentage 70-75 or even 80 of mechanical pulp in bagasse newsprint for having the desirable properties very much there in woodpulp newsprint.

Author's Recommendations:

In view of the failures and partial and in some case full success achieved in the world various newsprint mills, I would very strongly recommend a furnish of 70-80% chemimechanical pulp (bagasse) and 20-25% chemical pulp (soft wood/bamboo/hard/wood/kenaf etc. etc.) depending on availability in plentiful supplies in the country/region) on the very model of 75-80% CMP (eucalypt) and 20-25% CP newsprint furnish on which India's both newsprint mills Hindustan Newspring (HPC) and Mysore Newsprint have been based and are running successfully. CMP from bagasse would be strong then that of CMP from eucalypt as fibre length of bagasse is 1.5-2.0 mm-double than that of eucalypt which is hardly 0.8-1 mm. Chemi Mechanical Pulping of bagasse would be more successful than TMP and CMP (coarse fraction) in that it will reduce the pulping streets to 2 instead of 3 and which reduces the maintenance and operating problems and project cost too in these days of zooming project costs and besides will give strong pulp and incase the opacity of CMP is lower than SGW (Soft wood) we could use filler/clay/talc on regular basis and a similar approach had been advocated by ENSO GUTZEIT OY in their publication Bagasse CMP for Newsprint wherein they described the laboratory and pilot plant work on Indian and Egyptian bagasse since 1978.

The opacity of CMP could be kept at the optimum level by controlling the % of NaOH in the pretreatment and higher dosages of alkali go to decrease the opacity/light scattering coefficient and one has to strike a balance between the strength increase and optical properties.

Besides the ratio of CMP: CP may be 70:30 or 75:25 or 80:20 would very much depend upon the quality of both the pulps CP and CMP and excellent quality would enable attaining a ratio of 75:25 at least or 80:20 which would not only be economical giving earlier ROI (Returns on investment) but also giving good opacity/light scattering coefficient (less of CP 20-25% instead of the normal of 30% would mean lesser lowering of opacity of newsprint) and no or lesser fillers/opacifiers.

CMP Process- Multifarious Advantages:

CMP process entails very many advantages such as:

- Simplicity and economic, requiring no sulfur chemicals in the pretreatment and little steam Neither pressure vessels nor elevated temperature.
- Higher yield of 82% + on depithed bagasse not only because of light/simple pretreatment but also peroxide bleaching which is lignin/yield preserving.
- Lesser power usage
1300 KWH/T (Compared with 1100 KWH/T for SGW
1600-1800 KWH/T for HMP
2000-2100 KWH/T for TMP and
1500-1600 KWH/T for CMP/(Hardwood).
- Lesser power requirements of auxiliary pulping equipment (Less pumps and washing in CMP)
- Opacity and light scattering coefficient higher/superior than any other bagasse process
- Pulp responding well to H₂O₂ or/and Na₂SO₄ bleaching.
- Drainage and strength properties better or equal to spruce stone Groundwood (SGW) the most commonly/widely used stock.
- Using a process concept well proven in industrial production and resembling to hardwood CMP mills already running in USSR, Argentina and India too.
- Employing equipment and machinery which is running in modern mills and has given good/reliable performance
- Pith can be utilised/burnt in fluidised bed for steam generation for paper machine.
- No power or equipment required in stock preparation in refining meaning additional savings and lower costs.

- Best solution for newsprint production especially in countries where bagasse is the only raw material (other bagasse processing methods though match or near match most of the quality requirements but due to their low yield and complicity are not competitive for newsprint and that is the very reason why most of the bagasse newspring mills changed to produce other expensive grades or the quantities of newsprint produced have been heavily subsidized by the Government)
- Having capability of being upgraded even for pulp grades for writing/printing and also if SC Magazine paper (high quality) writing/printing (surface sized) are also to be produced besides newsprint.
- Yellow hue of CMP can be masked by a judicious use of dyes even if the opacity of the 75% CMP bagasse newsprint is low, some talc can be added and in case the newspring shows some dusting tendency we could use some PVA.

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