

SHARKARA

JANUARY – MARCH 2019

VOLUME-50, No. - 01



NATIONAL SUGAR INSTITUTE

Department of Food & Public Distribution

Ministry of Consumer Affairs, Food & Public Distribution

Government of India

Kanpur-208 017, INDIA

Email: nsikanpur@nic.in

Visit us at: <http://nsi.gov.in>

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SHARKARA

VOLUME-50, NO .01

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IT CONTAINS.....

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Sugar & allied industries are facing sustainability issues due to fluctuating profits from sugar business and increasing concerns towards water, chemical and environmental foot prints. Sugar industry has to look forward for balancing sugar demand-supply equilibrium and emerge as a promising hub for bio-based products & green technologies. With ample transformational opportunities available through government support, diversification towards green, bio base products like bio-ethanol assumes greater significance in wake of surplus sugar production & providing green fuel.

National Sugar Institute which is committed towards development of green bio based technology for economic and green sustainability of the sugar industry has taken this initiative and many such technologies developed are now available for commercialization through National Research Development Corporation, New Delhi. Green technologies for diversification & value addition can aid in building a profitable & sustainable sugar industry, catering to the sugar mills, growers & in fact to all stakeholders. In an effort to strengthen the sugar sector government has also taken many initiatives & policy interventions in the recent past which includes capacity building for ethanol production, sugar exports and facilitating sugar liquidity at appropriate prices. Sugar Industry is also required to come forward and make investments in developing R&D facilities in house or through collaboration with institutes.

I look forward welcoming you during the 4th Annual Convention of North Indian Sugarcane & Sugar Technologists Association (NISSTA) which is being organized at the institute on 29th and 30th May 2019.

(Narendra Mohan)
Director

➤ OUR PROVISIONS:

➤ SEMINAR ORGANIZED:

1. One day seminar on "Ethanol: Policy, Productivity & Profitability" organized by National Sugar Institute on 28th February 2019 at New Delhi was inaugurated by Shri Vijay Goel, Chairman, Dhampur Sugar Mills Ltd. Director, National Sugar Institute made opening & introductory remarks on the topic. Shri D. Swain, Prof. Sugar Engineering, Dr. (Mrs.) Seema Paroha, Prof. Bio Chemistry and Shri Vinay Kumar, Asstt. Prof. Sugar Engineering also attended the seminar.



The seminar was concluded with a message to develop distilleries working on multiple feed stocks, benchmarking of the performance parameters & focusing on developing newer technologies to achieve ZLD.

2. Director, National Sugar Institute inaugurated one day seminar on the topic "Mill Performance Improvement – A review" organized by J. P. Mukherji & Associates Pvt. Ltd., Pune jointly with Lal Bahadur Shastri Ganna Kisan Sansthan, Lucknow on 30th March, 2019. Shri D. Swain, Prof. Sugar Engineering, Shri Vinay Kumar, Asstt. Prof. Sugar Engineering, Shri Anoop Kumar Kanaujia, Asstt. Prof. Sugar Engineering & Shri P Prashant also attended the seminar.



➤ AWARD & BOOK RELEASE :

Director, National Sugar Institute was conferred with "Lifetime Achievement Award" & his book entitled "An Insight to Sugar Manufacture" was also released during the International Conference "SUGARCON 2019" held at Lucknow, U.P. from 16-19th February 2019.



➤ WORKSHOP ATTENDED :

Director, National Sugar Institute attended the workshop on "Compressed Bio Gas (CBG) – an Opportunity for the Sugar Industry" organized by Ministry of Petroleum and Natural Gas jointly with ISMA 21st January, 2019. He also made an innovative presentation on production of "Bio CNG from Filter Cake". Dr. (Mrs.) Seema Paroha, Prof. Biochemistry also attended the workshop. She also attend the technical seminar organized by AIDA and presented a paper on economics of B-Heavy diversion.



➤ FOREIGN DELEGATION:

High level delegation from Nigeria visited the institute to look into the academic and research activities. They also desired to seek institute's assistance for setting up a sugar institute at Nigeria & on various other technical aspects of sugar production.



➤ OUR RESEARCH AREAS:

The Institute is actively involved in the collaborative endeavors with the sugar and allied industries for developing innovative techniques and technologies for improving the overall profitability of the sugar industry.

The Institute during the period took up R&D work on the following:

➤ RESEARCH:

1. Utilization of potash rich ash for production of valuable bio fertilizer- Boiler ash from Incineration Boilers installed in molasses based distilleries can be used as carrier for making bio-fertilizer. Field trials of various treatments using these bio fertilizers are in progress. Sowing of crop *urad* has been done as per the selected treatments at the institute farm.



2. Utilization of bagasse as dietary fiber- Studies on characteristics of bagasse as a food supplement initiated. Bagasse sample obtained from juicer machine was analyzed for its 1. Moisture content & Ash content 2. Composition (cellulose, hemicelluloses, lignin). 3. Physical properties (swelling power, solubility index, water absorption capacity, oil absorption capacity, bulk density) before and after chemical treatment.



3. Bio-CNG from Filter Cake– With an aim to utilize the filter cake for production of Bio-CNG, different combinations filter cake, farm yard manure and spent wash were initially tried on laboratory scale & then a small pilot plant was developed. New set for “Production of Bio-CNG from Filter cake” has been set up. Initial trials indicate production of 1 kg Bio-CNG from about 30 kgs filter cake.



Previously different chemicals like NaOH, KOH and lime water etc. were used for scrubbing of gases evolved during production of methane. In the new set of experiments, water scrubbing was also tried for the purpose of gas scrubbing. Results revealed that with water scrubbing, only 15-20 percent of pure methane was obtained indicating that purity levels were less as compared to lime water which gave 85 to 95 % pure methane.

4. Studies on the feasibility of utilization of sugarcane bagasse as a potential feedstock to access cosmetic ingredients – Study aims at valorization of pentose sugars of bagasse. The synthesis & isolation of target compound from bagasse derived xylose solution has been completed. The purification and its characterization is on-going. The outcome of the study is expected to explore a new area of utilization of bagasse i.e. for producing cosmetic ingredients.

5. Studies on synthesis of glycosidic surfactants using by-product resources of sugar industry – Studies have been further taken up so as to enhance the yield of bagasse derived polypentosides based surfactant along with reduction in purification steps involved thereof. Current research activities focus on scaling up the developed process and to find out the production cost estimates. Two new sets of reactions (on 100 gm scale @ sugar cane bagasse dry weight) are being used to validate the results. Further studies are in progress.

6. Studies on production/isolation of C5-Sugar Alcohol/Sugar using by-product resources of sugar industry – The studies aim basically at deriving a low-calorie sweetener from bagasse. Following has been carried out under the study:

- i. The initially isolated compounds are being analyzed for characterization.
- ii. The isolation of xylose as hydrolysate from sugarcane-trash has been carried out.

7. Studies on pot efficient synthesis of alkyl levulinates (Als) using sugarcane bagasse derived cellulose – With an aim to isolate cellulose (to be used as starting material) from bagasse, experiments have been carried out to fractionate hemicelluloses and lignin (three steps process). The step first (hemicelluloses extraction) has been completed.



8. Mechanical clarification of juice – This research work has been taken up with a view to minimize use of chemicals for production of white sugar. Experiments were conducted with application of different flocculent doses & centrifugation times. Encouraging results have been observed with respect to colour and turbidity removal & further experiments with cane juice & analysis of data obtained is being carried out.

9. Use of brine reject in final molasses – Brine recovery and disposal of brine reject is an area of concern from environment angle. Fresh sample of brine reject and molasses were procured and further experiments are being conducted to assess the effect of brine reject on molasses quality upon storage. Its effect on fermentability of the molasses is also under study.

10. Super short retention time clarifier – With an aim to reduced retention time in clarifier modified design having inclined surfaces for mud settling has been developed. Preliminary trials on pilot scale were conducted successfully and the quality of clear juice was found at par or even better than the clear juice from conventional clarifier. Further trial will be carried out with some modifications in the design.



RESEARCH PAPERS/ POSTER / PRESENTED / PUBLISHED/ SENT FOR PUBLICATION:

1. **“Sustainability of Sugar Industry – Sugar Production and Beyond** by Narendra Mohan was presented in Sugarcon-2019 held at IISR, Lucknow from 16-19th February, 2019.
2. **“Sugarcane as Energy cane, an Enormous Source of Bioenergy”** by Narendra Mohan & D. Swain have been accepted for presentation in International Conference on Biofuels and Bioenergy to be held at San Francisco, CA, USA from 29th April to 01st May, 2019.
3. **“Effect of Potassium Application on Nutrient Uptake, Yield and Quality of Sugarcane & Sustainable Soil Health”** by Narendra Mohan, Ashok Kumar & Lokesh Babar published in International Journal of Green Farming volume - 10 no.1 page - 105-107.
4. **“Biomass Energy for Economic & Environmental Sustainability in India”** by Narendra Mohan & Anoop Kumar Kanaujia published in Sugar Technology-An International Journal of Sugar Crops and related industries.
5. **“Experiences with B- Heavy Molasses Diversion for Ethanol Production”** by Narendra Mohan, D. Swain & Dr. Seema Paroha presented during Technical Seminar organized by All India Distiller’s Association on 7 - 8th February, 2019 at New Delhi.
6. **“Sugar Production to Meet Consumer Preferences”** by Narendra Mohan presented during “Sugarcon-2019” on 16-19th February, 2019 at IISR, Lucknow, U.P.
7. **“Techno Economic Viability of Ethanol Production from B- Heavy Route”** by Narendra Mohan, D. Swain & Dr. Seema Paroha presented during national seminar jointly organized by NSI- NFSC on “Ethanol- Policy, Productivity & Profitability on 28th Feb, 2019 at New Delhi.
8. **“Mill Efficiency Improvement”** by D. Swain presented during seminar organized by J. P. Mukherji & Associates Pvt. Ltd., Pune jointly with Lal Bahadur Shastri Ganna Kisan Sansthan on 30th March, 2019 at Lucknow, U.P.
9. **“Efficient Milling”** by D. Swain presented during seminar organized by J. P. Mukherji & Associates Pvt. Ltd., Pune on 28th March, 2019 at Meerut, U.P.
10. **“Innovation is the change that unlocks new values”** by Narendra Mohan & Ashok Garg published in International Sugar Journal, February, 2019.

➤ BUREAU OF SUGAR STANDARDS:

The Institute on behalf of Bureau of Indian Standards prepares and issues Sugar Standard Grades to the entire Sugar Industry of the country for every sugar season. These Sugar Standard Grades are issued to facilitate quality control and to protect the interest of the common consumers. On the basis of these grades, sugar factories mark their produce accordingly.

On the basis of the approved Standards, Bureau of Sugar Standards Grades distribution commenced from 1st October, 2018.

Price schedule for the sugar season 2018-19:

1	Sugar Standard Grades to be issued	L-31, L-30, M31, M-30, S-31, S-30 & SS-31
2	Set of New Sugar Standard Grades containing 7 grades +3 empty glass bottles + 3 Velvet Cork in packing case	Rs.15000/= each set
3	Single Sugar Standard Grade	Rs.1900/= each
4	Empty Sugar Standard Glass Bottle	Rs.325/= each
5	Packing case	Rs.485/= each
6	Velvet Cork	Rs.80/= each
7	Postal expenses, forwarding charges, if any	Extra as applicable
8	Demand Draft to be sent	In favour of Director, National Sugar Institute , payable at Kanpur
9	Delivery of Sugar Standard Grades	Monday to Friday (10.00 AM to 5.00 PM)
10	Taxes	GST extra as applicable @18%. See SSOP

➤ PREPARATION AND SALE OF SUGAR STANDARDS:

Sale of sugar standards for the sugar season 2018-19 commenced from 1st October, 2018. Bureau of Sugar Standards issued 127 Sugar Standard Grades to 29 sugar factories during January-March, 2019.

➤ OUR ADVISORY:

Besides conducting teaching and training programmes, carrying out research in relevant field, another main function of the institute is:

1. To function as a “Think-tank” to sugar and allied industry for proposing modernization and trouble free functioning of the process on advisory basis / through Extension Services.
2. To formulate strategies and promotes measures for expansion of capacities, energy conservation, co-product utilization etc. for sugar and allied industries.
3. To assist Govt. of India through technical contribution in policy formulation and control of Sugar Industry.

➤ CONSULTANCY SERVICES:

During January-March, 2019 consultancy services were provided to the following:

1.	M/s DSCL Sugar, Rupapur, Distt – Hardoi, U.P.
2.	M/s L.H. Sugar Factory, Distt – Piliphit, U.P.
3.	M/s Harinagar Sugar Mills Ltd., West Champaran, Bihar.
4.	M/s Mawana Sugar Works, Mawana, Distt – Meerut, U.P.
5.	M/s Dalmia Sugar Mills Ltd., Ninai Devi, Distt – Kolhapur, Maharashtra.
6.	M/s Dewan Sugar Ltd., Distt – Moradabad, U.P.
7.	M/s Rai Bahadur Narain Singh Sugar Mills Ltd., Laksar, Distt – Haridwar, Uttarakhand.
8.	M/s DSCL Sugar, Hariawan, Distt – Hardoi, U.P.
9.	M/s DSCL Sugar, Ajbapur, Distt – Lakhimpur-Kheri, U.P.
10.	M/s EID Parry (India) Ltd., Sankili, Andhra Pradesh.
11.	M/s Avadh Sugar Energy Ltd., Hargaon, Distt – Sitapur, U.P.
12.	M/s Dhampur Sugar Mills Ltd., Dhampur, Distt – Bijnor, U.P.
13.	M/s Kisan Sahkari Chini Mills Ltd., Unit – Nazibabad, Distt – Bijnor, U.P.
14.	M/s The Shahabad Co-op. Sugar Mills Ltd., Shahabad, Distt – Kurukshetra, Haryana.
15.	M/s Kichha Sugar Company Ltd., Distt – Udham Singh Nagar, Uttarakhand.

16.	M/s Triveni Engineering & Industries Ltd., Unit -Khatauli, Distt – Muzaffargarh, U.P.
17.	M/s Uttam Sugar Mills Ltd., Barkatpur, Najibabad, Distt – Bijnor, U.P.
18.	M/s Olam Agro India Pvt. Ltd., Distt - Gurugram, Haryana.
19.	M/s DSCL Sugar, Hariawan, Distt – Hardoi, U.P.
20.	M/s Uttam Sugar Mills Ltd., Unit – Libberheri, Distt – Haridwar, Uttarakhand.
21.	M/s Dhampur Sugar Mills, Asmoli, Distt – Moradabad, U.P.
22.	M/s Chadha Sugar & Industries Pvt. Ltd., Batala, Distt – Gurdaspur, U.P.
23.	M/s Indian Sugar Exim Corporation Ltd., New Delhi.
24.	M/s Triveni Engineering & Industries Ltd., Unit – Rani Nangal, Distt – Moradabad, U.P.
25.	M/s Triveni Engineering & Industries Ltd., Unit – Chandanpur, Distt – Amroha, U.P.
26.	M/s National Forum of Sugar Consultants, New Delhi.
27.	M/s Panipat Co-operative Sugar Mills Ltd., Panipat, Haryana.
28.	M/s Dhampur Sugar Mills Ltd., Unit – Mansurpur, Distt – Muzaffargarh, U.P.
29.	M/s Bannari Amman Sugar Ltd., Distt – Coimbatore, Tamil-Nadu.
30.	M/s Triveni Engineering & Industries Ltd., Sugar, Unit – Milak Narayanpur, Distt – Rampur, U.P.
31.	M/s Dalmia Sugar & Industries Ltd., Unit – Kolhapur, Maharashtra.
32.	M/s Shri Datta Sakar Karkhana, Distt – Kolhapur, Maharashtra.
33.	M/s Sonipat Co-operative Sugar Mills Ltd., Sonipat, Haryana.
34.	M/s Kesar Enterprises Ltd., Distt – Bareilly, U.P.
35.	M/s Shri Malaprabha Sahakari Sakkare Karkhana, Hubli.
36.	M/s Daurala Sugar Works Ltd., Distt – Meerut, U.P.
37.	M/s Haryana Co-operative Sugar Mills Ltd., Panchkula, Distt – Rohtak, Haryana.
38.	M/s Triveni Engineering & Industries Ltd., Unit - Sabitgarh, Distt – Bulandshahr, U.P.
39.	M/s Triveni Engineering & Industries Ltd., Unit - Ramkola, Distt – Kushinagar, U.P.

➤ ANALYTICAL SERVICES:

The institute now has a Centralized NABL Accredited Analytical Laboratory to carryout analysis of sugar, molasses, alcohol and other related products as ICUMSA and other standards protocol. During the period, analytical services were rendered to following:

1.	M/s Dalmia Sugar Mills Ltd., Nigohi, Distt – Shahjahanpur, U.P.
2.	M/s The Kisan Sahkari Chini Mills Ltd., Mahmodabad, Distt – Sitapur, U.P.
3.	M/s Shree Madhi Vibhag Khand Udyog Sahakari Mandli Ltd., Distt – Surat, Gujarat.
4.	M/s Rudra Bilas Kisan Sahkari Chini Mills Ltd., Bilaspur, Distt – Rampur, U.P.
5.	M/s Balrampur Chini Mills Ltd., Unit – Babhnan, Distt – Gonda, U.P.
6.	M/s U.P. Co-operative Factory Federation Ltd., Lucknow, U.P.
7.	M/s DSCL Sugar, Rupapur, Distt – Hardoi, U.P.
8.	M/s DSCL Sugar, Loni, Distt – Hardoi, U.P.
9.	M/s Simbhaoli Sugar Mills Ltd., Distt – Ghaziabad, U.P.
10.	M/s DSCL Sugar, Unit - Loni, Distt- Hardoi, U.P.
11.	M/s DSCL Sugar, Unit – Rupapur, Distt- Hordoi, U.P.
12.	M/s Harinagar Sugar Mills Ltd., Harinagar, West Champaran, Bihar.
13.	M/s Shahabad Co-operative Sugar Mills Ltd., Shahabad, Distt – Kurukshetra, Haryana.
14.	M/s K.M. Sugar Mills Ltd., Distt – Faizabad, U.P.
15.	M/s Dalmia Sugar Mills Ltd., Unit – Nigohi, Distt – Shahjahanpur, U.P.
16.	M/s Ninaidevi Sakhar Karkhana, Distt – Sangli, Maharashtra.
17.	M/s Global Cane Sugar Services Pvt. Ltd., New Delhi.

The samples of sugar, molasses, ethanol, waste waters, effluents & condensates etc. were analyzed for the desired parameters in the NSI-Analytical Laboratory.

➤ VISIT OF DIGNITARIES:

1. Mr Narayan Thete, Eminent Sugar Technologist of 1974 batch visited the institute with Mr Bhad of S.S. Engineers to work jointly on performance evaluation of Diffusers.
2. Mrs. Usha Chandrasekhar, Ex. Chief Post Master General of India & daughter of Late C. V. Subba Rao, who was a student of Sugar Technology course during 1949-51 visited the Institute. She constituted a gold medal in memory of her father to be given to the student of Sugar Technology course securing first rank in the final examination.



➤ OTHER ACTIVITIES :

1. "KRISHAK SAMVAAD" was organized at the institute providing platform for creating awareness among farmers about new sugarcane varieties, planting method from bud chip to trench planting, methods of irrigation including micro-irrigation and on inter--cropping.



2. Experimental Sugar Factory operated during the crushing season 2018-19 where students of Sugar Technology First Year Course got their in-plant training. Trials of few new equipments viz. stirrer-less juice sulphiter and moisture control unit was also made.



3. The Institute celebrated 70th Republic Day on 26th January, 2019. On this occasion, Shri Narendra Mohan, Director hoisted the National Flag and took the salute from the security guards. Highlighting the commendable work carried out by the institute for teaching and training facilities, he called upon the staff and students of the institute work in a mission mode so that the institute may achieve the greater heights.



4. SBI-ATM at NSI, Kanpur was inaugurated on 1st February, 2019 by Prof. Narendra Mohan, Director, National Sugar Institute.



5. Under the Swachhta Activities taken up by the institute, a bio-toilet was provided by the institute to nearby Government Primary School (Girls). Awareness was also created amongst the students about Swachhta.



6. Students of B. Tech (Biotechnology) CSJM University visited Experimental Sugar Factory on 16th February 2019 and took keen interest to know various unit operations carried out for production of sugar.



7. Swachhta oath was administered to staff and students and special cleanliness drive "Swachhta Pakhwada" was undertaken in and around campus from 16th February, 2019. Essay & painting competitions and Nukkad Natak were also organized involving staff & students of the institute.



8. New Year Get-together function was organized at the institute on 20th January, 2019. Many distinguished alumni graced the occasion.



➤ **HAPPENING IN THE SUGAR INDUSTRY:**

Govt to crack down on sugar sales below floor price.

The Indian government has asked regional cane commissioners to take action against sugar mills selling sugar below a government-mandated price, a letter seen by Reuters showed. The sugar mills are facing a cash crunch as they also have to pay stipulated prices to buy cane from farmers.

As sugar season draws to a close, 122 mills end crushing ops in Maharashtra.

Around 122 sugar mills in Maharashtra have completed crushing, with the state's sugar season rolling in to its last leg. A total of 195 factories participated in the operation this season. Of these, 93 factories are private and 102 are from the cooperative sector.

Guatemala drags India to WTO's dispute mechanism over sugar subsidies.

After Brazil and Australia, Central American country Guatemala Monday dragged India into the World Trade Organisation's (WTO) dispute settlement mechanism alleging that New Delhi's sugar subsidies to farmers are inconsistent with global trade rules.

State with highest, lowest production Sugarcane in last four years.

As per ministry of Agriculture & Farmers Welfare's Annual Report 2017-18 India has emerged as a significant agri-exporter in a few crops viz. rice, cotton, sugarcane, cashew nut, castor seed and groundnut.

Seeking release of dues, 4 cane farmers protest on roof of Dhuri SDM's office.

Four sugarcane farmers on Monday climbed on the roof of the Dhuri SDM's office and started a protest for the release of their dues. They carried a bottle of petrol with them. Harjeet Singh Bugra, one of the farmers, said they had started an indefinite hunger strike.

Pakistan gets ahead of India to bag sugar export quota from China.

Pakistan has taken a lead over India by winning a 300,000-tonne sugar export quota from China, according to traders. India has been waiting since long to bag the export quota from China.

Bitter NPA pill for Renuka Sugars' lenders.

A stern interpretation by the Reserve Bank of India (RBI) of its contentious February 12 circular has stunned banks. The regulator has told banks to categorise a particular loan account as non-performing asset (NPA) almost a year after the borrower's debt was rejigged and the firm had received fresh capital infusion.

As elections approach, cane farmers in Punjab step up pressure with fresh protests over dues.

With polls round the corner, farmer unions have once again started their protest campaigns against the Punjab government over non-payment of sugarcane dues. Two unions — Bhartiya Kisan Union (Lakhowal) and Bharti Kisan Union (Ugrahan) — have started dharnas at separate sites in Dhuri area of Sangrur.

6 sugar stocks jump over 20% in two months. Are they a good bet?

As many as six stocks from the sugar sector, including names such as Dhampur Sugar Mills, Avadh Sugar & Energy and Uttam Sugar Mills have climbed over 20 per cent in the last two months, thanks to an array of government initiatives to boost the sector.

Haryana: Sugarcane farmers continue to wait for their dues.

The Haryana cane commissioner Ajit Balaji Joshi on Tuesday called a meeting with the farmers and Naraingarh Sugar Mill management at Krishi Bhawan in Panchkula with regards to the performance of the sugar mill which is defaulting on releasing timely payments to the sugarcane farmers of the area.

Maharashtra: Sugarcane acreage may fall 40% in Maharashtra next season.

At a time when India and the world markets are grappling with excess sugar stocks, the area under sugarcane could decline more than 40 per cent in Maharashtra in the next season owing to drought.

Sugarcane reinvented as 'energycane' could be future of cane industry, renewables.

Using gene editing to create sugarcane varieties especially for use in renewables and bioplastic industries could be the future. University of Queensland Professor, Dr Robert Henry, said that sugarcane's reinvention as an "energycane" crop could sustain the industry in the face of falling global demand for sugar.

March sugar sales come to a standstill on overselling.

Sugar sales in March have come to a halt across the country. Trade and industry sources indicated that overselling by sugar mills in the previous months in anticipation of an increase in government-set floor price has blocked the pipelines, pulling demand down.

India, Australia locked in sugar trade dispute at WTO.

India has to enter into consultations and answer all the specific issues within 30 days after Australia told the World Trade Organization (WTO) that the minimum support prices (MSP) and export subsidies provided to sugarcane and sugar producers by the Narendra Modi government and several state governments violate global trade rules.

Sugar mills worry about retrospective tax burden after Supreme Court judgment.

Sugar mills across the country are apprehensive about the burden of retrospective income tax, following a recent decision of the Supreme Court on how the tax should be calculated for mills.

Govt fixes sugar sale quota at 24.5 lakh tonnes for March.

Sugar mills can sell 24.5 lakh tonne of the sweetener in the open market in the current month, the government said on Tuesday. The central government has allocated sugar quota for sale to each of the 524 mills in the country.

UP clears land transfer to Indian Oil Corp for Rs 800 crore ethanol plant.

Public sector behemoth Indian Oil Corporation (IOC) will take 50 acre land on lease in Gorakhpur, the home turf of chief minister Yogi Adityanath, for setting up an ethanol plant costing nearly Rs 800 crore. The land belongs to the defunct Dhuriapar cooperative mill in Gorakhpur district.

CM HD Kumaraswamy to gift new sugar factory to Mandya.

Chief Minister HD Kumaraswamy on Monday said his government will set up a new sugar factory in Mandya, where his actor-son Nikhil is tipped to be the JD(S) candidate in the Lok Sabha polls.

Sugar mills protest 'high' sales quota, say it will make clearing cane dues difficult.

The underlying objective seems to be to force mills to sell more sugar in order to generate extra cash flows to liquidate cane arrears, which, according to the Centre, have reached a level of Rs 20,159 crore as on February 22.

Punjab cabinet gives nod to disburse Rs 25 per qtl to cane growers.

The Punjab cabinet Saturday gave nod to disburse Rs 25 per quintal to cane growers out of the state agreed price (SAP) of Rs 310 for the crushing season 2018-19. The balance amount of Rs 285 per quintal will be paid by the private sugar mills.

Sugarcane arrears to growers to come down by Rs 9,000 crore: ISMA.

The government's decision to provide up to Rs 10,540 crore as soft loans to sugar millsNSE 3.52 % will help them in clearing arrears of cane growers by about Rs 9,000 crore, a top industry official said on Friday. Indian SugarNSE 2.86 % Mills Association (ISMA) Director General Abinash Verma said millsNSE .

Brazil to challenge India's sugar subsidies in WTO consultation.

The Brazilian government on Wednesday asked the World Trade Organization to start a consultation regarding India's sugar industry subsidies, which the South American country says is distorting global trade. Australia also formalized a similar consultation request challenging the Indian

government's subsidies, according to a joint statement from Brazil's foreign relations and agriculture ministries.

Artificial sweetener: Politics addresses only the arrears of sugar mills, not the populist pricing that creates the problem.

With elections beckoning, politics over sugarcane arrears has gained traction once again. But it is unlikely to really address the troubles dogging the sugar industry.

Parties struggle to crack code in UP's bitter sugarcane belt.

When cane season was at its peak, Mayank Tiwari, who works with an insurance company in Ahmedabad, received a message from his brother about a crisis on the family's sugarcane farms in UP's Kheri district. The mill to which they were selling cane had refused to buy any more of it.

Seeking release of dues, 4 cane farmers protest on roof of Dhuri SDM's office.

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Tamil Nadu: Farmers allege Rs 350crore scam by sugar mills.

While accusing two private sugar mills in Thanjavur of availing loans to the tune of Rs 350 crore from nationalized banks taking advantage of the ignorance of sugarcane farmers, the members of farmers association have sought a CBI inquiry to fix the culprits in the multi-crore scam.

Maharashtra: To push retail sale by mills, sugar commissioner writes to district collectors & Zilla Parishads.

State Sugar Commissioner Shekhar Gaikwad has written to district collectors and chief executive officers (CEOs) of Zilla Parishads, urging them to buy sugar, for the various institutions in their jurisdiction such as hostels and hospitals, directly from mills.

Sugar mills worry about retrospective tax burden after Supreme Court judgment.

Sugar mills across the country are apprehensive about the burden of retrospective income tax, following a recent decision of the Supreme Court on how the tax should be calculated for mills.

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Casuarina cultivation on the rise.

Casuarina cultivation has become a popular option among farmers of Narsipatnam division in Visakhapatnam district. Traditional crops such as coconut and sugarcane have been replaced by casuarina, which is a low-maintenance crop, with little human resource requirement, horticulture department officials said on Friday.

Don't force us to sell more in depressed market: Sugar mills to govt.

Despite depressed sugar prices, the government has for the last few months kept the monthly quota for mandatory sales high for the mills. For March, the sales quota has been fixed at 24.5 lakh tonne, up 17% over the level in February.

Farmer stage rail blockade for payment of cane dues.

Members of the Bhartiya Kisan Union staged a blockade at the railway station here on Wednesday seeking payment of pending sugarcane dues. The protest delayed the Garhwal Express from Delhi to Kotdwar by 15 minutes.

Brazil center-south sugar output to rise 11 pct-INTL FCStone

Brazil center-south region will produce 29.5 million tons of sugar in the 2019-20 seasons, up 11 percent over the previous crop but less than projected previously, INTL FCStone said in a report. GSCStone had projected in January sugar production of 30.2 million tons in the new season that starts officially in April, although some mills are already harvesting.

➤ RESEARCH ARTICLE:

“PAN BOILING WITH 3RD VAPOURS VS 4TH VAPOURS IN CASE OF MULTIPLE EFFECT EVAPORATORS. DESIGN ASPECTS & OPERATIONAL FEASIBILITY – CRITICAL STUDY”

by

Sura. K. Bhojaraj

ABSTRACT:

Now days, in order to reduce steam consumption as far as possible, attempts are made to boil pans with 3rd /4th vapours.

Here we have concentrated in minimizing the Steam consumption by adopting an effective evaporator scheme involving Falling film Evaporators for all effects, in conjunction with Continuous pans for all massecuite boiling & adopting the application of Beet Sugar Industry like taking out last effect vapours at higher temperature (less vacuum) . This scheme is tried in Indian Sugar Industry in the recent past.

Further, we have taken up two cases, one with 3rd effect bleeding for all massecuite boiling by using continuous pans & the other with fourth effect bleeding for pan boiling. In both the cases Exhaust pressure is kept at 1.35 kgs/cm².g @ 125 .5 deg C saturation temperature & last body vapours leaving at 85 deg C. Accordingly the juice heater bleeding pattern is kept with the same pattern in both the cases. In evaporator station condensate flash advantage is considered. Mechanical circulators to be considered in tightening zones of continuous pans.

Important thing is to examine the operating quantities of juice, to enable these sort of bleeding pattern to happen.

Automation for Evaporator station & Pan stations are considered.

Further, we have considered 5000 TCD Sugar plant as a case study. The steam consumption in both cases are estimated.

The estimated steam consumption is 28.5 % in 1st case & 27 % in second case. The operational difficulty in second case is vividly narrated.

Evaluation of heating surfaces with this modified configuration in both cases is also done

Key words: VLJH (Vapour line Juice heater), DCH (Direct contact heater),FFE (Falling film evaporator),CVP (Continuous vac. pan) ,PTH (Plate type Heat Exchanger),JH (Juice heaters).H.S.A (Heating surface area), Pr.(Pressure) & Temp. (Temperature), ΔT (Temp. difference), S.J. Sulphited juice, ΔT (temp. difference).

INTRODUCTION:

Here attempt is made to examine the system design & operational aspects of quintuple set evaporators will all effects of Falling film type & Continuous pans for all massecuite boiling preferably with stirrer in tightening zone to handle boiling with low pressure vapours.

We have considered Quintuple system with application of various heat recovery devices & utilizing 3rd vapours for all massecuite boiling in one case & utilizing 4th vapours for A & B boiling & 3rd vapours for C boiling in second case.

The availability of Exhaust at comparatively higher pressure in Cogeneration plants from Extraction cum condensing turbines, enable continuous steady supply to evaporator station at a desired pressure. We have chosen a Pressure of 1.35 kg/cm².g (125.5degC,saturation temperature) & limiting the last effect vapours @ 85 deg C @0.58 kg/cm².abs to have a ΔT of 40.50deg .C, results in rearrangement of bleeding pattern. For this application Quintuple effect is more suited than other schemes considering the vapour loading conditions. Further we have considered various heat recovery devices such as condensate flash recovery system, & replacing medium pressure & low pressure steam applications in Super heated wash water system,Sulphur burners ,Seed melting , Molasses conditioning & pan washing etc, brings down the steam consumption at evaporator station considerably. Concept of stand by /floating bodies are narrated, to keep up sustained working through out the season.

History of applications:

The conceptual idea of pressure evaporation in first three effects & less vacuum in 4th effect of Quad, with clear juice entry of 2nd effect, was presented by the authour in Sugar refresher course conducted by N.S.I in 2004.

Later the application to 3500 TCD plant & estimation of steam consumption by using enthalpy balance around each effect presented as Part I in SISSTA 2006 annual convention & Part II in D.S.T.A convention 2006 & awarded gold medal & first prize respectively.

Similar application on comparative study of various bleeding systems & effect on steam economy was presented in Joint convention of S.I.S.S.T.A & S.T.A.I in 2009 & awarded Dr.Lala Bansidhar Gold medal.

Similarly for application to Quintuple with all FFE bodies with last effect on less vacuum, was presented in 2011 joint convention of D.S.T.A & S.T.A.I & awarded first prize.

Later Sri Renuka Sugars adopted, first time in India, this sort of Evopration scheme, with FFE sets for all effects of Quintuple, & CVP sets for all Raw massecuite boiling, to an Integral Raw Sugar with back end refinery in one of their units & later balanced for 36% steam, working successfully, since last 8-9 seasons.

Text of the Paper:

Case study:

A) Here Exh.Pr.kept at same value $1.35 \text{ kg/cm}^2\text{.g}$, but last effect @ less vacuum i.e $0.58 \text{ kgs/cm}^2\text{.g}$. This aspect enables to use all effects of Quintuple of FFE type.

Corresponding calculation in case of Quintuple with suggested bleeding & operating conditions in case of 5000 TCD plant:

Basic data:

Crushing capacity: (5000/22 hrs/228 TCH)

M.J % Cane : 110 : 250.8 T/Hr, Imbibition % Fibre 250+:

Filtrate returns 10%: 22.8 T/Hr

Total load to JH's : 273.6TCH(120% on cane)

Cl.J% Cane 108% on cane: 246.24 T/hr.Brix 14.0,Cp (Sp.heat considered 0.92)

Syrup Brix : 62.00 : % Evaporation: 76

Massecuite % cane : A- 30/B-12/C-8 (50 % on cane)

Exh. Condition : $1.35 \text{ kg/cm}^2\text{.g}$ @ 125 deg C & vacuum in last body @ $0.58 \text{ kg/cm}^2\text{.g}$ (85 deg C)

Corresponding pr.temp. distribution in Quintuple set:

Details	Exhaust	1 st effect vapour.	2 nd effect vapour	3 rd effect vapour	4 th effect vapour	5 th effect vapour
Pr. Kg/cm ² .abs	2.35	1.96	1.59	1.235	0.8986	0.58
Temp. deg C	125.5	119.50	113	105.5	97	85
Latent heat λ Kcals/kg	522.4	527.50	531.50	536.47	541.84	549.30

Bleeding pattern:

R.J Initial heating : 35 to 45 deg C by CVP out let vapours (VLJH) : 4090 Kgs/hr

R.J 2nd heating from 45 to 60 deg C by Condensate heating (Horizontal heater)

R.J final/ correction heating from 60 -72 deg C by last body vapours :5040 Kgs/hr

S.J 1st heating from 67-77 deg by condensate cross heating

S.J 2nd 1st heating from 77 to 93 deg by 4thvapours (DCH) = 7384 kgs/hr

Juice load to S.J 3rd heating : 273600 +7384 = 280984 (123.24%)

S.J 3rd heating from 93 to 102 by 3rdvapours(DCH) = 4309Kgs/hr

Juice load to Clarifier : 280984+ 4309 = 285293 kgs/hr (125.13 % on cane)@ 11.74 Brix

From there flash losses (0.8%) 1824 kgs ,underflow (12.5%)28500 kgs/hr taken out .Added Bagacillo (0.8%) 1824 kgs . So clear juice coming out from Clarifier is 285301-1824+1824 -28500 =256793kgs/hr 112.63 % @ 13.42 Brix

CL.J 1st heating by 3rdvapours 95 to 100 deg C by PHE = 2202 kgs/hr

CL.J 2nd heating by 2ndvapour 100 to 110 deg C by DCH = 4420 kgs/hr

Clear juice going to 3rdheating : 256793+ 4420 = 261213 kgs/hr

Cl. J Final heating by 1stvapour 110 to 116 deg C by DCH = 2715 kgs/hr

Clear juice load to Evaporators:

$$261213 + 2715 = 263928 \text{ kgs/hr} (115 \cdot 76 \%) @ 13.06\text{Bx}$$

Pan boiling : (Considering All massecuites are to be boiled by Continuous pans):

Vapour requirement: For A 0.375 kgsvapour / kg of masscuite ; for B 0.275 kgs/kg & for C 0.30 kgs/kg. (including graining/footing)

$$228000 \times 0.30 \times 0.375 = (25650 \text{ kgs/hr}) \text{ for A -Massecuite (11.25 on cane)}$$

$$228000 \times 0.275 \times 0.12 = 7524 \text{ kgs/hr for B massecuite(3.3 \% on cane)}$$

$$228000 \times 0.3 \times 0.08 = 5472 \text{ kgs/hr for C massecuite(2.4\% on cane)}$$

3rd effect vapour for A ,B & C – boiling including graining / footing

$$38646 \text{ Kgs/hr (16.95 \% cane)}$$

Pan washing : 0.5 % cane 1140 kgs/hr by 2ndvapours

Seed melting by 2ndvapours 1.0% ,2280kgs/hr

Molasses conditioning by 3rd vapours ,0.5%1140 kgs/hr

Total Evaporation in Quintuple:

$$263928 (62 - 13.06) / 62 = 208340 (78.935\%) \text{ kgs/hr .Syrup Quantity} = 55596 \text{ kgs/hr}$$

$$(24.38\%)$$

$$E = 208340 \text{ kgs/hr} = 5x + 4(7392) + 3(4309 + 2202 + 38646 + 1140) + 2(4420 + 1140 + 2280) + 2261 +$$

$$X = 4388 \text{ kgs/hr} (1.92 \% \text{ on cane})$$

Corresponding evaporation in kgs/hr in Quintuple :

I – 68178 / II – 65917 / III – 58077 / IV – 11780 / V – 4388 Kgs/hr

H.S.A 's considered I-3500 x1/II-5000 /III- 5000 /IV -1500/V-1000 = 16000 m²

Rate of evaporation:I- 19.48/II-13.18/III- 11.62/IV-7.85/V- 4.39 Kg/m²/hr

Exhaust requirement @ Evaporator station: 68178/ Kgs/hr(29.90 % cane)

29.90– 2.50 % Condensate flash advantage = 27.40 % cane

Overall steam consumption in case of configuration under study:

Evaporation steam demand 27.40 + Miscellaneous demand 0.5 % (less because of application of various heat recovery devices) + Losses 0.5 % =28.40 i.e **28.50 % on cane**

B)2nd Case : Here Exh.Pr.kept at same value 1.35 kg/cm².g ,but last effect @ less vacuum i.e 0.58 kgs/cm².g.This aspect enable to use all effects of Quintuple of FFE type. But we are contemplating 4th effect vapours for A& B massecuite boiling & 3rd vapours for C massecuite boiling.

Corresponding process design calculation in case of Quintuple with suggested bleeding & operating conditions in case of 5000 TCD plant:

Basic data:

Crushing capacity: (5000/22 hrs/228 TCH)

M.J % Cane : 115 : 262.20 T/Hr, **Imbibition % Fibre 275+:**

Filtrate returns 10%: 22.8 T/Hr

Total load to JH's : 125% cane /285 T/hr

Cl.J% Cane 113% on cane: 257.64.Brix *13.0,Cp (Sp.heat considered 0.92)

Syrup Brix : 62.00 : % Evaporation: 79.03

Exh. Condition :1.35 kg/cm².g @ 125 deg C & vacuum in last body @ 0.58 kg/cm².g (85 deg C)

Corresponding pr.temp. distribution in Quintuple set:

Details	Exhaust	1 st effect vapour.	2 nd effect vapour	3 rd effect vapour	4 th effect vapour	5 th effect vapour
Pr. Kg/cm ² .abs	2.35	1.96	1.59	1.235	0.8986	0.58
Temp. deg C	125.5	119.5	113	105.5	97	85
Latent heat λ Kcals/kg	522.4	527.50	531.50	536.47	541.84	549.30

Bleeding pattern:

R.J Initial heating : 35 to 45 deg C by CVP out let vapours (VLJH) : 4275 Kgs/hr

R.J 2nd heating from 45 to 60 deg C by Condensate heating (PHE)

R.J final/ correction heating from 60 -72 deg C by last body vapours : *5270 Kgs/hr

S.J 1st heating from 67-77 deg by condensate cross heating

S.J 2nd 1st heating from 77 to 93 deg by 4th vapours (DCH) =

$$228 \times 1000 \times 1.25 \times 0.92 \times (93-77)/(541.84 + 4) = *7686 \text{ kgs/hr}$$

Juice load to S.J 3rd heating : 285000 + *7686 = *292686 (128.37%)

S.J 3rd heating from 93 to 102 by 3rd vapours(DCH)

$$292686 \times 0.92 \times (102-93)/ (536.47 + *3.5) = 4488 \text{ kgs/hr}$$

Juice load to Clarifier : 292686 + 4488 = 297174 [kgs/hr@130.34%](#) on cane/11.27Brix

From there flash losses (0.8%) 1824 kgs ,underflow (12.50%)28500 kgs/hr taken out .Added Bagacillo (0.8%) 1824 kgs . So clear juice coming out from Clarifier is $297174 - 1824 + 1824 - 28500 = 268674$ kgs/hr 117.84% @ 12.47 Brix

CL.J 1st heating by 3rd vapours 95 to 100 deg C by PTH = 2304 kgs/hr

Cl. J 2nd heating by 2nd vapour 100 to 110 deg C by DCH = 4624 kgs/hr

Clear juice going to 3rd heating : $268674 + 4624 = 273298$ kgs/hr

Cl. J Final heating by 1st vapour 110 to 116 deg C by DCH = 2841 kgs/hr

Clear juice load to Evaporators:

$273298 + 2841 = 276139$ kgs/hr (121.11 %) @ 12.11 Bx

Pan boiling : (Considering All massecuites are to be boiled by Continuous pans):

Vapour requirement: For A 0.375 kgs vapour / kg of masscuite ; for B 0.275 kgs/kg & for C 0.30 kgs/kg.

$228000 \times 0.30 \times 0.375 = 25650$ kgs/hr for A –Massecuite (11.25 on cane)

$228000 \times 0.275 \times 0.12 = 7524$ kgs/hr for B massecuite (3.3 % on cane)

$228000 \times 0.3 \times 0.08 = 5472$ kgs/hr for C massecuite (2.4% on cane)

4th effect vapour for A &B– boiling including graining & 3rd effect vapours for C boiling including graining/footing

Vapour requirement (3rd effect vapours) for C pan boiling = 5472 Kgs/hr/(2.4 % on cane) including grain/footing making .

4th vapours for A&B – boiling including Footing making :33174 Kgs/hr (14.55 % cane)

Pan washing : 0.5 % cane 1140 kgs/hr by 2nd vapours

Seed melting, Drier & C/Fwashing by 2nd vapours 1.0% ,2280 kgs/hr

Molasses conditioning by 3rd vapours ,1140 kgs/hr

Total Evaporation in Quintuple:

$276139 (62 - 12.11)/62 = 222203 (80.47) \text{ kgs/hr}$.Syrup Quantity = 53936 kgs/hr (23.66%)

$E = 222203 \text{ kgs/hr} = 5x + 4 (7686+25650+7324) + 3 (4488+ 2304+5472+1140) + 2 (4624 +1140+ 2280) +2841$

$X = 85 \text{ kgs/hr} (0.0375\% \text{ on cane})$

Corresponding evaporation in kgs/hr in Quintuple :

I – 65034 / II – 62193 / III –54149 / IV –40745/V-85Kgs/hr

H.S.A 's considered I-3500 x1/II-3500x1/III- 5000 x1/IV-4000 x2 /V-200 = 20200 m²

Rate of evaporation:I- 18.58/II-17.77/III- 10.83/IV-5.09/V- Kg/m²/hr

Exhaust requirement @ Evaporator station: 65034/ Kgs/hr(28.52 % cane)

28.52– 2.50 % Condensate flash advantage = 26.02 % cane

Overall steam consumption in case of configuration under study:

Evaporation steam demand 26.02 + Miscellaneous demand 0.5% (less because of application of various heat recovery devices) + Losses 0.5 % = 27.02 i.e **27 % on cane**

Comparision of overall steam consumption in case of straight Quintuple case I (with 3rd vapours for pans) & case II (with 4th vapours for A & B boiling & 3rd vapours for C boiling).

The steam saving of 28.50. % on cane in case I ,when compared to 27 % in case II. A reduction of 1.5 % on cane.

For 5000 TCD plant & for 180 days of operation ,the net steam saving is,

$5000 \times 1.5 \times 180/100 = 13500 \text{ tons/season}$

By taking conversion factor of 2.10 ,the equivalent bagasse saving is 6430 tons/season.

Taking a price of Rs 2500/ton of Bagasses , money realization is **160 lakhs/season**

In terms of power produced in a Cogeneration plant :

$228 \times (1.50 / 100) \times 1000 / 7.50 \text{ kgs/kwhr} = 456 \times 24 = 10944 \text{ units/day}.$

Considering Rs 6.50 /unit ,per day realization is Rs 71136/.For a season of 180 days ,the corresponding realization is 130 **lakhs** .This is also quite attractive proposition.

For extra heating surface of $20200 - 16000 = 4200 \text{ m}^2$. The manufacturing cost of Evaporators, including fittings & valves with S.STubes & Automation , works out to be 200 lakhs including Erection ,but excluding Supporting staging & piping. So the pay back period in two season. This is the major benefit.

Evaporator station Configuration (in first case)

To avoid stoppage of Evaporators for cleaning , the concept of floating bodies is recommended. One FFE of 3500 m^2 H.S.A for 1st . Another FFE of 5000 m^2 for 2nd & 3rd effect as floating . Last two effects have one floating FFE of 1500 m^2 area.

In case of FFE sets ,the floating body will be taken into line ,whenever the regular body is isolated for C.I.P(cleaning in place).Usage of sulphomic acid & caustic soda followed by high pr.jet water cleaning is practiced.

Evaporator station Configuration (in second case)

3500 FFE as floating body for I &II ,5000 FFE as floating body for III &IV ,spare body of 200 m^2 for V

In case of FFE sets ,the floating body will be taken into line ,whenever the regular body is isolated for C.I.P(cleaning in place).Usage of sulphomic acid & caustic soda followed by high pr.jet water cleaning is practiced.

Provision of Mechanical tube cleaning , w/o dismantling the top cover:

In one design ,the top part above juice distribution is given sufficient head room ,so that ,entire ring of Juice distribution assembly is lifted up & hanged to Top cover, without opening it. Then Mechancal tube cleaning could be done.

In another design ,the top cover is bolted to top part .Debolt & tilt &raise the top cover by lever arrangement (as done in Juice heaters) ,for mechanical tube cleaning, if necessary during the season .

Automation: VFD's are to be provided for Clear juice feed pump & recirculation pumps. Flow meters are to be provided for Clear juice inlet ,recirculation duty & out let syrup.Flow control has to be provided for recirculation pumps.

Steam flow control & vapour stabilization systems have to be provided. Brix measurement of inlet juice & outlet syrup have to be provided. Brix control to be provided for out going syrup.

Condenser Automation is to be considered.

Pan station Configuration:

Considering all CVP sets for massecuite boiling , for this capacity one needs 70 T/hr for A, 30 T/hr for B, & 20T/hr for C.

To take care of low crush rates to begin with , it is better to provide one CVP of 30T/hr& the second one of 40T/hr for A-boiling.

Another pan of 30T/hr capacity is to be provided as floating pan , to come into line , when one of the units is isolated for water boiling.

We have suggested to have an improvised model incorporating mechanical circulator in tightening zone, considering these capacities. This will enable the pans to boil on 3rd /4th vapours effectively.

Automation:

The automation in tightening zone include heating medium (vapour control) loop , hot water control loop, Brix indication loop (conductivity/RF based/ Micro wave transmitter etc)& condensate measurement). This is apart from regular automation being provided to boiling zone of CVP , which include Brix measurement & control for alternate compartments & correction for the last one , heating vapour control, ratio control for magma: molasses, absolute pressure control etc all based on PLC system , could be hooked to DCS of the plant Automation. The measurement of molasses/syrup & condensate is done .

Condenser Automation is to be considered.

***Effect of tube heights:**

In case of Continuous pans of horizontal configuration with short vertical tubes:

For 2nd vapours : 900 mm tube height in boiling zone & 800 mm in tightening zone.

For 3rd vapours : 800 mm in boiling zone & 750 mm in tightening zone

For 4th vapours : 750 mm in tightening zone & 700 mm in tightening zone.

In all cases the tightening zones are incorporated with top suspended Mechanical Circulator with VFD.

Critical observation:

If 4th body bleeding to be considered for A& B boiling & 3rd body bleeding for C boiling & keeping juice heater bleeding pattern as same in previous case (but at higher Imbibition % fibre of 275%), the steam consumption will come down to 27 % on cane ,but the heating surfaces distribution is as below:

I -3500 M2/II -3500 M2/III – 5000 M2 -1/IV – 4000 X2 / V- 200 M2 (total 20200 m2)

Resulting in huge heating surface in 4th effect & very less heating surface in last effect. It will effect juice distribution in last effect .Particularly in case of low crush rates these higher surfaces tends to develop scaling problem & increase inversion also.

To avoid this imbalance .if we revert to Quad ,then the steam consumption will go up to 30 %. That's why we have favoured all massecuite boiling by 3rd effect. Resulting in steam consumption below 28.5 % on cane.

Precautions to be taken:

**These measures are sensitive to fluctuations.*

**Ample Imbibition % fibre 250+ ,to be provided for effective vapour bleeding.*

**System governed by Automation needs steady state conditions.*

**For 5000 TCD & above plants need to run on minimum 70 -75% of rated capacity on TCD basis.*

**System of Automation needs trained Instrumentation Engineers & Technicians & regular training programmes on the aspect of operation & maintenance ,to upgrade the skills is a must.*

Conclusion:

The above work out based on modified configuration of evaporators with effective use of Falling film evaporators & continuous pans with modified bleeding pattern & application of various heat recovery devices such as condensate flash recovery system, Direct contact heaters & replacing medium pressure & low pressure steam applications in Super heated wash water system, Sulphur

melting, Seed melting Molasses conditioning & pan washing etc, brings down the steam consumption at evaporator station considerably.

Further liberal use of floating body concepts are suggested in JH,Evaporator& pan stations to achieve efficient working & to sustain the same through out the season in case of large capacity plant , which is a basic requirement of Cogeneration plants/Integral Sugar complexes.

We have considered usage of less vacuum in last effect , to employ FFE for all effects ,to enable to boil all massecuite pans are 3rdvapours& similar rearrangement of juice bleeding gives steam saving ,which in turn produces more power ,which is beneficial to Cogeneration plants.

If we adopt 4th vapours for pan boiling ,then the heating surfaces of 3rd & 4th are large & 5th effect is very small ,creating difficulties ,when running under capacity.

Figures attached:

- 1) G.A (General arrangement) of two most popular designs of FFE .
- 2) G.A of CVP (Integral design having mechanical Circulator in tightening zone)
- 3) Modified Evaporator configuration scheme (Two cases)
- 4) Annexure I : Heat transfer area estimation case I
- 5) Annexure II : Heat transfer area estimation case II

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Annexure I: H.S.A Distribution calculation :

The pressure & Temp. Drop across the evaporator set based on calendria pressure of 1.35 kg/cm².g (125.5 deg C) & last body vacuum @ 0.58 kg/cm². a (85.00 deg C). Exh : 2.35 kg/cm².a(125.5) deg/Ist effect 1.96(119)/2nd effect 1.59 (113)/3rd effect 1.235(105.5)/ 4th effect 0.8986 (97) /5th effect 0.58 (85)

Corresponding evaporation in kgs/hr in Quintuple :

I – 68178 / II – 65917 / III –58077 / IV –11780/V- 4388 Kgs/hr

Calculation of leaving Brix & avg. Brix: $263936 \times 13.06 = 3447004 = x$

Sr. No	Details	Leaving Brix	Avg. Brix
I)	x/ 263936- 68178	17.61	15.34
II)	x/195758- 65917	26.55	22.08
III)	x/129841-58077	48.03	37.29
IV)	x/ 71764- 11780	57.97	53.00
V)	x/ 59984- 4388	62.00	59.98
	x/ 55596		

Calculation of B.P.E/ Δ T

Heating medium	Ts (Sat .Temp)	BPE	Te	Δ T (Deg C)
Exhaust	125.5	-	-	-
1 st Vapour	119.5	0.2	119.7	5.80
2 nd Vapour	113.	0.2	113.2	6.30
3 rd	105.5	0.55/0.59	106.05	6.95
4 th	97	0.76	97.76	7.74
5 th	85	1.65	86.65	10.35

Calculation of Sp. Evaporation coefficient:

- I) $0.001 (100 - 15.34) (125.5 - 85) = 3.429$
 II) $0.001 (100 - 22.08) (119.5 - 85) = 2.688$
 III) $0.001 (100 - 37.29) (113 - 85) = 1.756$
 IV) $0.0009(100 - 53.00) (105.5 - 85) = 0.954$
 V) $0.0009 (100 - 59.98) (97 - 85) = 0.4322$

Heating surface area calculation (m²):

Sr.No.	Details of calculation	Area estimated	To be provided	Remarks
I)	68178/5.80 X 3.429	3428	3500	3500&2 (one working & one std.by)
II)	65917/ 6.3 X 2.688	3893	5000	5000 x1

III)	58077/ 6.95 X 1.756	4759	5000	5000 x 2 (1floating for II &III)
IV)	11780/ 7.74X 0.954	1595	1500	1500 x2 (1 floating for IV &V)
V)	4388/ 10.35 X 0.4322	981	1000	1000

H.S.A/TCD Ratio =16000/5000 =3.20 m²/TCD

Rate of evaporation: I- 19.48/II-13.18/III- 11.62/IV-7.85/V- 4.39 Kg/m²/hr

Annexure II: H.S.A Distribution calculation : (in second special case)

The pressure & Temp. Drop across the evaporator set based on calendria 1.35 kg/cm².g (125.5 degC)& last body vaccum @ 0.58 kg/cm². a (85.00 deg C).

Exh : 2.35 kg/cm².a(125.5) deg/Ist effect 1.96(119)/2nd effect 1.59 (113)/3rd effect 1.235(105.5)/ 4th effect 0.8986 (97) /5th effect 0.58 (85)

I – 65034 / II – 62193 / III –54149 / IV –40745/V-85Kgs/hr

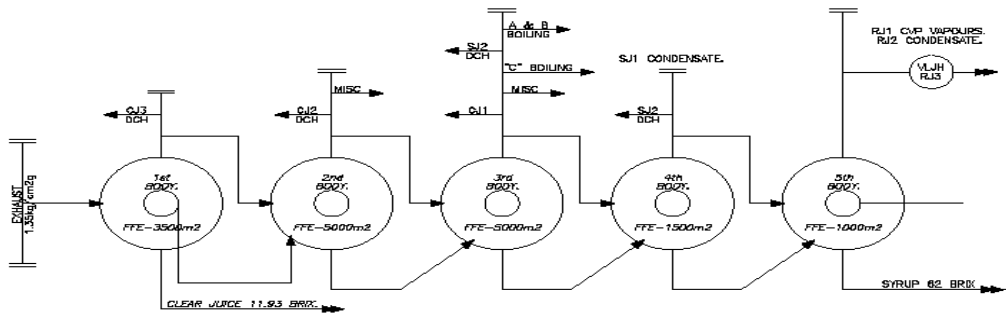
With the similar method of calculations ,the results are summarized ,as it will be lengthy to include in publication :

Details	Corresponding Ts deg C	BPE deg C	ΔT deg C	Sp.Evap.coeff.	H.S.A m²
Exh .pr	125.5	-			
1 st vapour	119.5	0.2	5.8	3.44	3500
2 nd vapour	113	0.2	6.3	2.738	3500 (2 including one floating)
3 rd vapour	105.5	0.55	6.95	1.9116	5000 (2 including one floating)
4 th vapour	97	0.76	7.74	0.8022	4000 x2
5 th vapour	85	1.67	10.33	0.3767	200 (2 including std.by)

H.S.A 's considered I-3500 x1/II-3500x1/III- 5000 x1/IV-4000 x2 /V-200 = 20200 m²

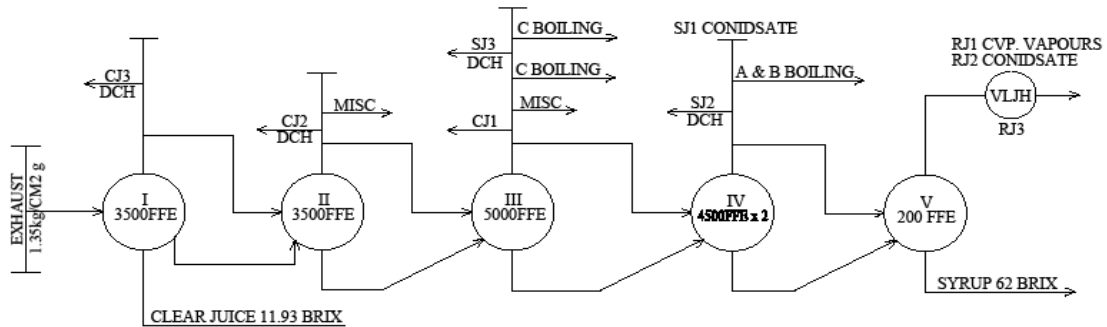
Rate of evaporation:I- 18.58/II-17.77/III- 10.83/IV-5.09/V- Kg/m²/hr

MODIFIED EVAPORATOR CONFIGURATION-2nd

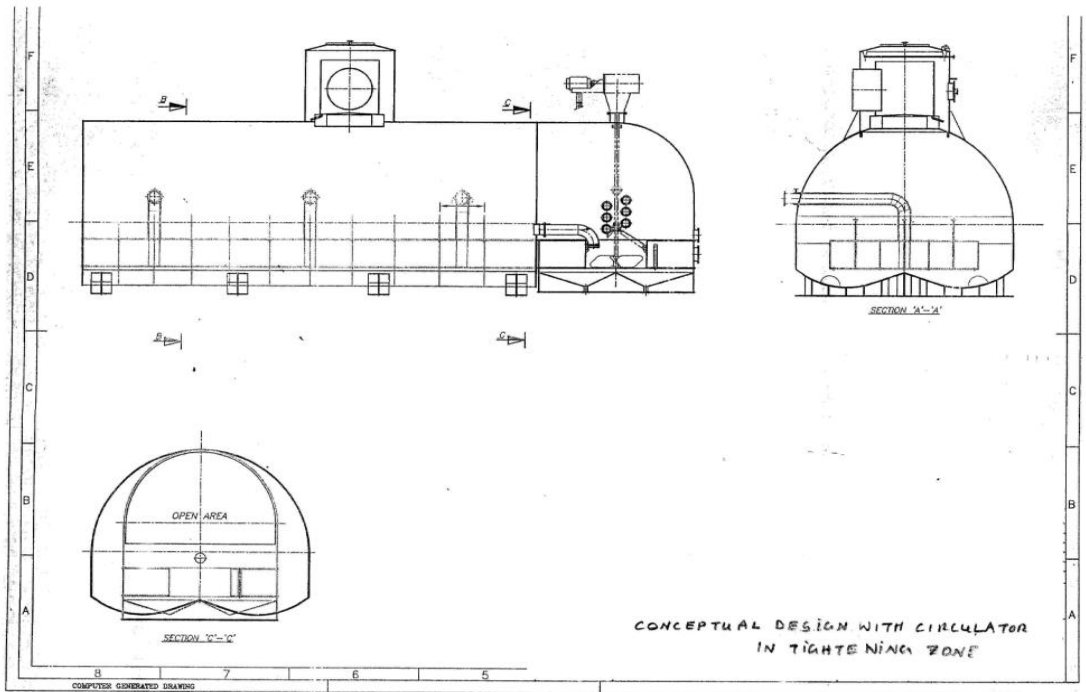
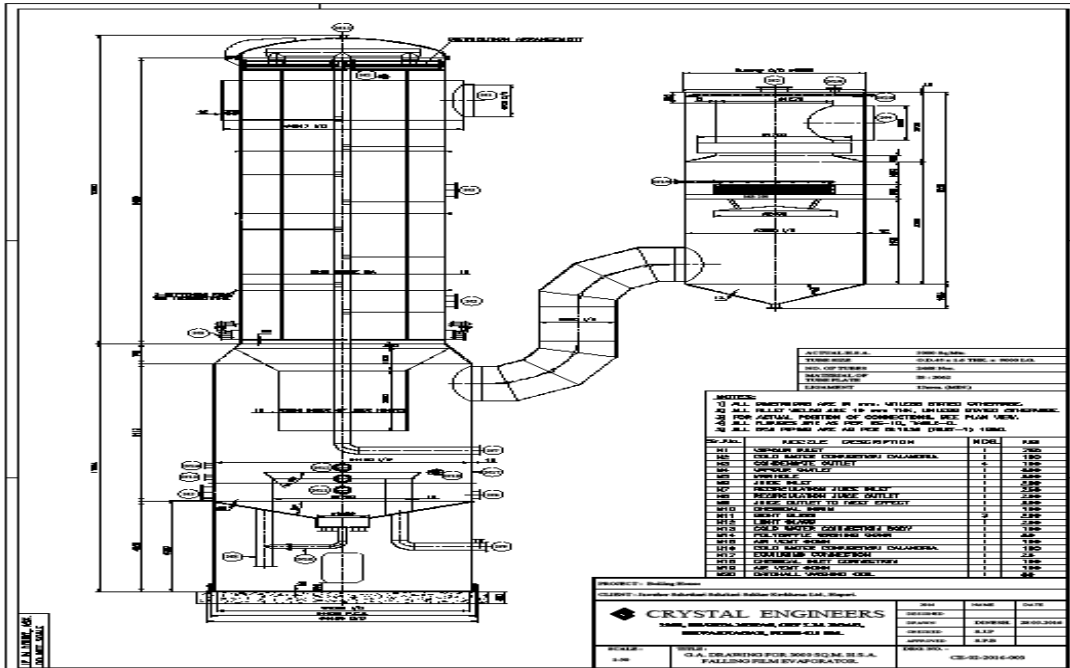


STAND BY FOR 1st-3500FFE, 2nd&3rd-5000FFE, 4th-1500FFE, 5th-1000FFE.

MODIFIED EVAPORATOR CONFIGURATION-II-R1



STAND BY FOR 1st & 2nd 3500 FFE. 3rd & 4th 5000 FFE & 5th 200 Mtr. Sq.



ABSTRACTS:

World of biofuels in 2019 by A.M. Mühlengraben published in International Sugar Journal in March, 2019.

Geo-politics, in particular the Sino-US trade war along with continued volatility in crude oil prices are likely to inform biofuels production in the foreseeable future, as will be the relative supplies of grain (for ethanol) and palm oil (for biodiesel).

RPAS products assessment and their application in sugarcane crops by César García & David Montero published in International Sugar Journal in March, 2019.

The main objective of sugarcane research in the geographic valley of the Cauca River in Colombia is to improve sugarcane production in the sugar sector of the country. Different types of Remotely Piloted Aircraft Systems (RPAS) equipped with conventional and modified cameras produce images with detailed spatial and spectral information. This, together with their fast, low cost and easy handling and data collection has turned them into a success in supporting precision agriculture.

Assessment of trends in run-off and sediment yield from catchments under sugarcane production and management practices by D. Otim, J. Smithers, A. Senzanje & R. Van Antwerpen published in International Sugar Journal in March, 2019. Run-off is dependent on interactions between rainfall

intensity, antecedent soil moisture conditions and land cover while peak discharge from a catchment is closely related to the run-off volume generated. Both run-off volume and peak discharge are drivers to sediment yield. The purpose of this study was to increase understanding of run-off and soil erosion processes from catchments under sugarcane production and various management practices (i.e. tillage and land cover). The study area was located at La Mercy on the site that now hosts the King Shaka International airport in South Africa.

Implications of using a condensate cigar on factory operations by R. Broadfoot & D. Rackemann published in International Sugar Journal in March, 2019.

The highly steam-efficient overseas cane factories almost universally undertake extensive flashing of vapour from condensates into the calandrias of evaporator vessels. The condensates subjected to flashing include condensates from the calandrias of evaporators and pans and from the vapour chests of non-contact heaters. The condensate management equipment is commonly referred to as a condensate cigar as the usual arrangement is a long horizontal vessel. The vessel contains several compartments operating at different pressures. The recovery of heat in the flashed vapour is primarily adopted in order to reduce the process steam consumption of the factory.

Influence of ethanol and sulphite dosing on oxygen scavenging in sugar mill boiler feedwater by C. Claxton, D. Rodman & M.

Sheehan published in International Sugar Journal in March, 2019.

Reducing corrosion in boiler feed water circuits is important to maintaining efficient thermal performance as well as minimising maintenance. Corrosion is typically controlled in boiler feed water through the addition of oxygen scavengers such as sodium sulphites, which act to reduce the dissolved oxygen (DO) concentration in the water. However, poor dissolved oxygen removal when using sulphite oxygen scavengers has been observed throughout the North Queensland sugar industry (Rodman et al., 2016). The cause of reduced oxygen scavenging capabilities of sodium sulphite is hypothesised to be a result of organic contaminants present in sugar mill boiler feedwater.

‘Sugar from space’: Using satellite imagery to predict cane yield and variability by J.S. Muir, A.J. Robson & M.M. Rahman published in International Sugar Journal in March, 2019.

Satellite imagery has been demonstrated to be an effective technology for producing accurate pre-harvest estimates in many agricultural crops. For Australian sugarcane, yield forecasting models have been developed from a single date SPOT satellite image acquired around peak crop growth. However, a failure to acquire a SPOT image at this critical growth stage, from continued cloud cover or from competition for the satellite, can prevent an image being captured and therefore a forecast being made for that season. In order to reduce the reliance on a single image capture and to improve the accuracies of the forecasts themselves.

The Florida sugar industry – trends and technologies by Jose F. Alvarez, Tere Pi (Johnson) Grace published in International Sugar Journal in February, 2019.

In the early 1990’s the Florida Sugar Industry had begun to implement new technologies by following the example of the Brazilian, Australian and the South African sugar industries.

Innovation is the change that unlocks new values by Narendra Mohan & Ashok Garg published in International Sugar Journal in February, 2019.

In our everyday life, innovation does as it says on the label – bringing it in from the finest fringes and putting it at the core of everything an organisation does, making it approachable and admissible for all. The major driving force towards development over the past few years has been the consumer demand towards safer food commodities, more nutritious, more natural, minimally processed but simultaneously, more readily available and convenient food products.

Louisiana, a revolutionary powerhouse for the sugar industry by Santiago Grimaldo M.S. published in International Sugar Journal in February, 2019.

As we all know, sucrose from sugarcane has been extracted and crystallized since ancient times and since its humble beginnings technologists have devised machines and equipment to make this process more efficient, profitable, and sustainable. This statement still holds today, when our industry is navigating

rough waters, but as William Ernest Henley brilliantly wrote in his poem Invictus “Under the bludgeonings of chance My head is bloody but unbowed.”

The sugar industry and new technologies by Stephen Peacock & Vadim Kochergin published in International Sugar Journal in February, 2019.

The most interesting technical feature of sugar industry is that it utilizes almost every unit operation of chemical engineering. Arguably, the most outstanding sugar industry innovation was patented by Norbert Rillieux of Louisiana in 1843 (US Patent 3237, figure 3), which proposed the use of secondary vapor for evaporation. This invention gave birth to the contemporary operation of multiple effect evaporation that is widely used throughout industry.

Mechanized cane harvesting by G.A. Kent published in International Sugar Journal in February, 2019.

To celebrate ISJ's 150th anniversary, several key players in the sugar industry highlight technological developments that have informed advances in the sector. These includes mechanizing cane harvesting, diffusion, juice purification and multiple effect evaporators. In their paper, Alvarez and Grace highlight technology trends that have supported the modernization of Florida's sugar industry.

How is the transparency of the assessment of the value of sugar beet and sugar cane

delivered by growers around the world guaranteed? by Matheus Mancini, Porfirio Nunes & Timothé Masson published in International Sugar Journal in February, 2019.

When it comes to the payment for their produce, beet and cane growers are invariably at the mercy of systems put in place largely by processors to elicit both quantity and quality. The lack of both relative control and transparency are significant issues when it comes to growers satisfying themselves that the payments they receive subsequently are commensurate with the laid down payment system. With contributions from 24 grower associations across the world, the World Association of Beet and Cane Growers (WABCG).

New trends of digital technologies – opportunities for sugar beet cultivation by A.K. Mahlein, M.T. Kuska, J. Behmann & S. Paulus published in International Sugar Journal in February, 2019.

A farmer has to make several decisions during crop growth. Availability of promising digital technologies for monitoring crop development are of particular interest in the agricultural sector. Within this context, the detection and identification of plant diseases or the detection and management of weeds is a fundamental task in sustainable crop production. An accurate estimation of disease incidence, disease severity and negative effects on yield quality and quantity is important for precision crop production or plant breeding. Assessment of weed plants and automatic differentiation from the sugar beet plants will

support a selective spraying or mechanical weeding.

Development of a new industrial method to measure starch in sugar products by Marsha R. Cole & Gillian Eggleston published in International Sugar Journal in February, 2019.

An easy, rapid, and inexpensive method was developed to measure total, soluble, and insoluble starch in products at the factory and refinery, using microwave-assisted neutralization chemistry. The method was optimized using the previously developed USDA Starch Research method as a reference. Optimal acid and base combinations and concentrations plus microwave time and power were determined to completely solubilize an insoluble corn starch reference. The final method, e.g. Cole Industrial Starch Method, solubilizes up to 4,000 ppm insoluble starch in 2 min, has acceptable precision (7% CV, coefficient of variation), accuracy ($\geq 94\%$), uses a corn starch reference.

Emergence of leaf fleck caused by Sugarcane bacilliform virus in sugarcane as a serious disease under field conditions in India by R. Viswanathan, R. Karuppaiah, K. Bagyalakshmi, Sanju Balan & K. Kaverinathan published in International Sugar Journal in February, 2019.

Sugarcane bacilliform virus (SCBV) causing leaf fleck was reported three decades ago in sugarcane and for many years its symptoms have not been clearly described. Initially the symptoms of fleck, mottling and mild mosaic were suspected with the virus infections in

Saccharum spp clones and no clear information was available on the virus infections and disease symptoms on the hybrid varieties. Further, reported PCR assay targeting 221 bp amplicon was not reliable for virus diagnosis from the SCBV-suspected clones of sugarcane. Hence a comprehensive study was made on leaf fleck symptomatology in Saccharum spp clones in germplasm and Saccharum.

'SIX EASY STEPS' nutrient management program: improving with maturity! by B.L. Schroeder, D.M. Skocaj, B. Salter, J.H. Panitz, G. Park, D.V. Calcino, G.Z. Rodman & A.W. Wood published in International Sugar Journal in January, 2019.

The 'SIX EASY STEPS' is a comprehensive, integrated and science-based nutrient management program developed by and for the Australian sugar industry. It is recognised as the basis for promoting and adopting nutrient best management practice (BMP) in sugarcane production in Australia. It is underpinned by six logical steps that are intended for cyclical learning and continuous improvement. The program was developed using an eleven-stage framework and focuses on profitable sugarcane production without causing adverse influences on soil fertility or off-farm effects.

Potassium dynamics in the soil-plant system and implications for fertiliser recommendations by D.E. Elephant, N. Miles & P. Muchaonyerwa published in International Sugar Journal in January, 2019.

Globally, in the development of potassium (K) fertiliser recommendations, neither non-exchangeable K reserves (reserve-K) nor K fixation are taken into account, due to the difficulties involved in their measurement. However, failure to account for these parameters may contribute to serious inaccuracies in addressing crop K requirements. This study assessed the impacts of including reserve-K and K fixation when developing fertiliser recommendations for sugarcane, and the potential of mid-infrared spectroscopy (MIR) to estimate these parameters. The investigation involved two field trials on soils with contrasting reserve-K and K fixation capacity, as well as a laboratory study on 132 top soils.

S-BEAT: A preliminary cost estimation method for the sugarcane biorefinery by P. Naidoo, D. Lokhat & A. Stark published in International Sugar Journal in January, 2019.

In recent years, key stakeholders within the South African sugar industry have been assessing the potential to further diversify their product portfolios. The suggested route is to assess the available sugar mill streams for their potential to manufacture value-added products. In principle, a multitude of new revenue streams can be generated which will serve markets of different sizes and values.

As a first stage assessment to allow for the selection of the most economically attractive product or process candidates, the Sugar Milling Research Institute NPC had developed the New Product Greenhouse (NPG) toolbox.

A Case Study on Colour Solid Balance by Vikas Shamrao Chavan published in proceedings of 76th annual convention of STAI, 2018.

Demand for good quality sugar by consumer industries is increasing. They required 50 to 60 IU sugar for better shelf life of their products. It was therefore desired to monitor colour during different stages of manufacturing process. The article describes a complete study of colour at each stage of manufacturing process for consistent review.

Stagewise Bagacillo Removal System by R.R. Ijate, G.V. Harale & B.G. Chavanke published in proceedings of 76th annual convention of STAI, 2018.

With higher preparatory index fine bagacillo particles are increasing in mixed juice. For good clarification these fine bagacillo particles should be removed. To remove these fine particles stage wise bagacillo removal system was adopted which includes two nos. standard open type rotary juice screens installed at milling tandem and one no. totally closed Hot Raw Juice screen installed in process house. This paper describes the equipment details, location details, data collection and advantages of the system.

Adoption of Technologies to Sustain the Productivity and Sugar Recovery by J.P. Singh published in proceedings of 76th annual convention of STAI, 2018.

In today's competitive time there is a big question how to save the farmers, the sugar industry and the consumers. To save all the three i.e. the producer, sugar industry and the consumers, the sugar industry should sustain. Hence, in this paper the technologies/ways and means have been suggested and described which will help to sustain the Farmers, Sugar Industry and the Consumers.

Effect of ohmic heating on polyphenol oxidase and peroxidase inactivation and color change in sugarcane juice by Vijay Singh Maurya, Ajay Singh Maurya & Ashish Kumar Singh published in Indian Sugar Journal in March, 2019.

Sugarcane juice was analysed for the treatment like ohmic heating. IN this study, the effect of ohmic heating on the quality of extracted juice was characterized by measuring the inactivation of sugarcane juice polyphenol oxidase and peroxidase with change in content of soluble solids (in brix), sucrose content (by polarimeter), pH and colour of the juice at various voltage gradients (24V/cm, 36, 48 V/cm and 60V/cm) were investigated. Ohmic heated juice showed better retention of physicochemical heating. Effect of ohmic heating on polyphenol oxidase and peroxidase inactivation and color change in sugarcane juice.

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Dr. Ashutosh Bajpai
Prof. of Sugar Technology

For & on behalf of:
NATIONAL SUGAR INSTITUTE
Ministry of Consumer Affairs,
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Department of Food
& Public Distribution
Kalyanpur,
Kanpur – 208017
Uttar Pradesh (India)

Visit us at
<http://nsi.gov.in>

Contact:
nsikanpur@nic.in
director.nsi@gov.in
Telephone
+91-512-2570730
Fax: +91-512-2570247