SHARKARA

OCTOBER - DECEMBER, 2021
VOLUME: 52, No. 04

ISBN: 978-93-5445-372-4

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VOLUME - 52, No .04

OCTOBER-DECEMBER, 2021

It contains……..

From Director's Desk…

The new sugar season 2021-22 has brought new hopes for the Indian Sugar Industry. The steady and better sugar prices with ethanol production making roads, the balance sheet of the sugar factories has improved as also indicated by the stocks.

The sugar production is likely to remain around 30.8 MMT during the sugar season 2021-22 after considering diversion of 3.5 MMT of sugar for ethanol and 5 MMT as exports. However, Uttar Pradesh the dominant sugar producing state has witnessed deterioration in prominent sugar cane variety particularly in central and eastern part of state with red rot. The late rains and floods in some parts of the state have also adversely affected the sugar cane yield and sugar recovery. However, there is greater diversion of B-heavy molasses and partial diversion of syrup has also been taken up by the state sugar factories. Similar trend has been reported from other major sugar producing state of Maharashtra and Karnataka.

The Institute remained vibrant with multiple activities viz. organizing foundation day, STAI convention, 50th convocation, seminars, webinars and training programs etc. during the period. Inspite of pandemic, campus placements were good and many of the renowned sugar groups selected the students of various courses .In pursuit of institute's efforts for a self sustainable sugar industry, research work also continued on production of value-added products from by-products and waste of sugar industry.

I wish all of you a Safe, Happy and Prosperous New Year 2022.

(Narendra Mohan)
Director

OUR PROVISIONS:

FOUNDATION DAY CELEBRATED:

National Sugar Institute, Kanpur while celebrating its "**Foundation Day**", also jointly organized 79th Annual Convention of Sugar Technologist Association of India (STAI) & International Expo on 4th - 5th October 2021. More than 5000 delegates attended the program through online and off-line mode.

Function was graced by Hon'ble Governor of U.P., Secretary (F & PD) and Additional Chief Secretary, Government of Uttar Pradesh. The Governor of U.P., congratulated NSI, Kanpur on its Foundation Day and stressed on working for greater farm mechanization, productivity enhancement and improvement in the quality of sugar to meet market requirements. She also lauded the role of NSI, Kanpur & STAI in growth & development of Indian Sugar Industry.



Secretary (Food & Public Distribution), Government of India, Shri Sudhanshu Pandey called upon the sugar industry to work together with NSI, Kanpur & other institutions to find solutions to its various problems & develop a word map for sustainability. The inaugural session was also addressed by Additional Chief Secretary, Shri Sanjay Bhoosreddy, Director, NSI and President STAI.



50th CONVOCATION CELEBRATED:

50th Convocation of National Sugar Institute, Kanpur was held on 16th November 2022. It was graced by Hon'ble Minister of Commerce & Industries, Textiles, Consumer Affairs, Food & Public Distribution and Hon'ble Minister of State, Consumer Affairs, Food & Public Distribution and Rural Development.

Shri Subodh Kumar Singh, IAS, Joint Secretary (Sugar & Administration), Department of Food & Public Distribution also graced the function. Fellowship, PG Diplomas and Certificates were conferred to 450 students who passed out during academic session 2018-19 and 2019-20.

TRAINING PROGRAMME ORGANISED:

Five days training programme on "**Operation of Sugar Factories & Distillery Units and their Effluent Management Techniques**" for the scientists of Central Pollution Control Board (CPCB) and National Mission for Clean Ganga (NMCG) was conducted by National Sugar Institute, Kanpur from 6th -10th December 2021. During the programme, officials from CPCB, Delhi, NMCG, Delhi, CPCB, Regional Directorate, Kolkata and CPCB, Lucknow participated in the programme.

An industrial visit of sugar factory/distillery unit for all the participants was also conducted a part of the training programme.

MoA/MoU SIGNED:

1. National Sugar Institute, Kanpur on 18th October 2021, signed a Memorandum of Agreement (MoA) with M/s Hydranautics, a Nitto Group multinational company, for developing membrane based technology for concentrating the sugar cane juice. First phase of trials to commence at M/s Balrampur Chini Mills Ltd., Kumbhi, Uttar Pradesh.



2. National Sugar Institute, Kanpur on 25th November 2021, signed a Memorandum of Agreement (MoA) with M/s Guljag Industries Ltd., Jodhpur, according to which the two organizations shall undertake development of sodium meta-bi-sulphite based innovative product for clarification of sugarcane juice.



3. National Sugar Institute, Kanpur on 30th November 2021, signed a MoU with Central Food Technological Research Institute (CFTRI), Mysore to conduct research work jointly on developing newer technologies and products. NSI, Kanpur to conduct special training programmes for CFTRI students of M.Sc. (Food Technology) course.



4. National Sugar Institute, Kanpur on 15th December 2021, signed a Memorandum of Agreement (MoU) with M/s Catalyst Biotechnologies to work on developing and testing enzymes to minimize deterioration of B Heavy molasses and syrup during storage. This is expected to give a boom to ethanol production from these feed stocks.



RESEARCH WORK:

1. Studies on isolation of Lignin from sugar industry based biomass and development of the process for the conversion of derived lignin and fermentable sugar to Value-added product - A paper entitled "Vanillin synthesis from sugarcane bagasse lignin in a bio refinery concept" was sent for presentation in upcoming SUGARCON-2022 and it has been accepted for presentation. The scale up study is ongoing on pressure rector at 10 gm scale.

2. Studies on synthesis of lactic acid from sugarcane bagasse hemicellulose - The characterization is not in favour of production of lactic acid in noticeable yield under applied conditions. The experiments related to varying different reaction conditions such pressure, pH temperature and loading of the catalyst in pressure reactor have been planned & experiments to be conducted shortly.

3. Studies on production of chloromethyl furfural from bagasse derived cellulose in biorefinery approach - 5-(Chloromethyl) furfural (CMF) is a carbohydrate-derived platform molecule that is gaining attention as a more practical alternative to 5-(hydroxymethyl) furfural (HMF). It can be derived from cellulose. Thus, inlight of our current interest to valorise each component of sugarcane bagasse, it will be promising approach for up-grading the value-added products from bagasse derived cellulose via synthesis of CMF.

4. Studies on Sweet Sorghum Bagasse value addition - Sweet sorghum bagasse is an untapped resourceful carbon-rich material that can be thermo chemically converted into various value-added product by implementing biorefinery approach. In light of current ongoing studies in the institute on sweet sorghum, the studies on generated by product- sweet sorghum bagasse will be fruitful in connecting total value chain. In this light, literature survey has been done and preparation of sweet sorghum bagasse towards utilizing it as a starting material for conducting experiments has been done.

5. To study the impact on performance of mechanically coupled twin induction motor drives for Shredder/ Fibrizer having unequal sharing of load and to design

& develop dedicated drive for the application – The items related to the research work taken to HBTU lab for interfacing, testing etc. The work is in progress & is expected to be completed soon. The programming part of microcontroller is under progress. Some corrections as per the requirement are being made.

6. Utilization of Potash Rich ash for production of valuable bio fertilizer - Field Experiment on sugarcane crop is on-going and crop will be harvested in mid of February 2022 so as to assess the effects of bio-fertilizers on its growth. Various parameters of the resultant juice will be analysed viz. Brix, Pol, Purity, RS, TRS, Ethanol yield along with yield attributing characters of sugarcane.

7. Study of yield and ethanol production potential from sweet sorghum in subtropical region – Five sweet sorghum varieties were grown at agriculture farm of the National Sugar Institute during August, 2021 and four nos. CSH 22SS, SSV 84, SSV 74 & ICSSH-28 were harvested during December, 2021. All the harvested sorghum varieties performed well in terms of physical appearance and average yield varied from 42 to 55 t/ha. The sweet sorghum varieties harvested on the basis of maturity and crushed by laboratory crusher (extraction percent varied from 60 to 65%) and extracted juice was utilized for assessing bioethanol potential.

8. Effect of Lead and Non-Lead clarificants on Polarization – The comparative study is being made to determine the polarisation of cane juice and other sugar liquor using lead sub-acetate and non-lead reagent (e.g. carrez's reagent) as clarificants and also by polarizing at the wavelength of 880 nm i.e. in NIR regions.

9. Use of B-heavy molasses as edible molasses - Few samples of B-heavy molasses were collected from sugar factories which are producing plantation white sugar, raw sugar and refined sugar & were analysed for Brix %, Pol %, Purity, RS% and TRS% etc. During the study, the analysis of heavy metals & other components like Ca, Mg, Mn, K & Fe etc., yeast and microbial count were also carried out. Further studies on some more samples are going on to conclude the study.

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RESEARCH PAPER:

1. A research paper entitled **"Natural Low Calorie Liquid Sugar from Sweet Sorghum – Commitment Toward Healthier Lifestyle"** by Narendra Mohan, Anushka Agarwal & Shruti Shukla, has been published in the proceedings of 79th Annual Convention of STAI, 4th - 5th October, 2021, PP-387 to 394.

2. A research paper entitled **"Trial of condensate polishing unit for sugar factories"** by Vanishtha Shukla, Sudhanshu Mohan, Sunil Bhate and Narendra Mohan has been published in the proceedings of 79th Annual Convention of STAI, 4th - 5th October, 2021, PP-415 to 425.

3. A review paper titled **"Possibilities of producing Biogas/CBG from filter cake"** by Narendra Mohan was sent for publication in International Journal for Scientific Research and Development (IJSRD), 30th October 2021.

4. A review paper titled **"Indian sugar industry: a potential hub for bio-energy"** by Narendra Mohan was sent for publication in Agricultural Science Congress 2021 held at BHU, Varanasi, October 19th, 2021.

5. A research paper entitled **"Bio-ethanol from sugar industry – The tool for survival"** by Narendra Mohan has been published in the proceedings of 66th Annual Convention & Sugar Expo 2021 of DSTA, October 30th, 2021.

6. A research paper entitled **"A Different Approach towards Controlling pH at Juice Clarification"** by Subhash Chandra, Virendra Kumar & Narendra Mohan" has been published in the proceedings of 79th Annual Convention of STAI, 4th - 5th October, 2021, PP-294 to 298.

7. A research paper entitled **"Compressed Biogas from Filter Cake of Sugar Industry"** by Narendra Mohan, Director, NSI Kanpur & Sanjay Awasthi, has been sent for publication in Cogen India Newsletter, Nov-Dec 2021.

8. A paper titled **"Performance Comparison of Conventional and Variable Frequency Drives for Sugar cane Preparatory Devices"** by Vinay Kumar & D. Swain, has been sent for publication in the proceedings of 7th IAPSIT International Sugar Conference and SUGARCON 2022, to be held at Lucknow.

9. A paper entitled **"Vanillin synthesis from sugarcane bagasse lignin in a biorefinery concept"** by Narendra Mohan, Dr. V.P. Srivastava, Chitra Yadav & Mamta Shukla, has been sent for presentation in upcoming 7th IAPSIT International Sugar Conference and SUGARCON-2022, to be held at Lucknow.

10. A research paper entitled **"Sugar Production to Meet Changing Market Requirements"** by Narendra Mohan has been sent for publication in Indian Sugar in December 2021.

BUREAU OF SUGAR STANDARDS:

राष्ट्रीय शर्करा संस्थान, कानपुर, भारतीय मानक ब्यूरो की ओर से, प्रत्येक चीनी मौसम के लिए देश के पूरे चीनी उद्योग के लिए चीनी मानक ग्रेड तैयार करता है और जारी करता है। ये चीनी मानक ग्रेड गुणवत्ता नियंत्रण की सुविधा और आम उपभोक्ताओं के हितों की रक्षा के लिए जारी किए जाते हैं। इन ग्रेडों के आधार पर चीनी मिलें अपने उत्पाद को उसी के अनुसार चिह्नित करती हैं।

शर्करा मानकों की एक्सपर्ट कमेटी की बैठक प्रोफेसर नरेन्द्र मोहन, निदेशक, राष्ट्रीय शर्करा संस्थान, कानपुर की अध्यक्षता में भारतीय गन्ना अनुसन्धान संस्थान, लखनऊ में सम्पन्न हुई। इस बैठक में भारतीय चीनी मिल संघ, भारतीय मानक ब्यूरो, नेशनल फेडरेशन ऑफ कॉरपरेटिव शुगर फैक्ट्रीज़ एवं भारतीय गन्ना अनुसंधान संस्थान इत्यादि के प्रतिभागियों ने भाग लिया। बैठक में शुगर सीजन 2021-2022 के लिये 7 शर्करा मानकों को स्वीकृति दी गयी जो कि लार्ज, मीडियम, स्माल एवं सुपर स्माल श्रेणी के होंगे और सुपर स्माल को छोड़कर सभी अन्य मानक 30 एवं 31 कलर श्रेणी में उपलब्ध होंगे। जिसमें 31 कलर श्रेणी उत्तम गुणवत्ता की प्रतीक हैं। ये मानक दिनांक 1 अक्टूबर 2021 को बिक्री हेतु जारी किये जा रहे हैं एवं इनको ऑनलाइन माध्यम से भी प्राप्त किया जा सकता है।

बैठक में समिति के सदस्यों ने काफी बड़ी संख्याचीनी मिलमें इन मानकों को बिना लिये अपनी चीनी के ग्रेड का निर्धारण किये जाने पर चिन्ता व्यक्त की एवं इस विषय पर खाद्य मंत्रालय को आवश्यक कदम लेने हेतु एक प्रस्ताव भेजने का निर्णय लिया।



Price schedule for the sugar season 2021-22:

1	Sugar Standard Grades to be issued	L-31, L-30, M31, M-30, S-31,S-30 & SS-31
2	Cost of Set of new Sugar Standards containing 07 grades +03 empty glass bottles + 02 velvet corks in packing case	Rs.22,000/= each set
3	Cost of Single Sugar standards Grade	Rs.2800/= each
4	Cost of Empty Sugar Standard Glass Bottle	Rs.500/= each
5	Cost of Packing Case	Rs.700/= each
6	Cost of Velvet Cork	Rs.120/= each
7	Postal Ecpenses for by POST demand	Extra as applicable

8	**ONLINE PAYMENT** can be made through **Bharat-kosh** * & Demand Draft may also be accepted, if online payment is not being processed due to some problem.	In favour of Director, National Sugar Institue, Kanpur payable at Kanpur.
9	Delivery of Indian Sugar Standards	Monday to Friday (10.00 AM to 5.00 PM)
10	Taxes i.e. GST	**GST extra as applicable (@18%)** for more details see **SSOP ***

The institute has taken up revision of various existing BIS standards viz. molasses tanks, raw, plantation white, refined and icing sugar etc. on behalf of Bureau of Indian Standards. BIS standards for some other sugars viz. organic sugar, brown sugar & low sulphur sugar are being drafted in consultation with various stake holders.

SALE OF SUGAR STANDARDS:

Sale of sugar standard grades commenced from 1st October 2021 for the sugar season 2021-22. Standard grades can be procured online also. The details are available on institute website **http://www.nsi.gov.in.**

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OUR ADVISORY:

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

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.

4. To render assistance to various government organizations in implementation of policies, validations and on associated matters.

5. To extend human resource management services to various government and private organizations.

CONSULTANCY:

Request for availing consultancy services of the institute was received from the following on various technical matters relating to diversion of B Heavy molasses/syrup, validation of ETP's, preparation of DPR's, validation of no increase in pollution loads in ethanol units upon enhancement in capacity etc.

1	M/s Bajaj Hindusthan Sugar Ltd., Unit – Rudauli, District – Basti, U.P.
2	M/s The Kisan Sahkari Chini Mills Ltd., Anoopshahar, District – Bulandshahar, U.P.
3	M/s UP Co-operative Sugar Mills Federation Ltd., Distillery Unit, Anoopshahar, U.P.
4	M/s Kisan Sahkari Chini Mills Ltd., Ghosi, District – Mau, U.P.
5	M/s Parle Biscuits Pvt. Ltd., (Distillery Division), District – Bahraich, U.P.
6	M/s Jubilant Ingrevia Limited, District – Amroha, U.P.
7	M/s Kisan Sahakari Chini Mills Limited, Najibabad, District – Bijnor, U.P.
8	M/s Bajaj Hindusthan Sugar Limited, Unit – Gola Gokarnath, District – Lakhimpur Kheri U.P.
9	M/s Bajaj Hindusthan Sugar Limited, Unit – Pratapur, District – Deoria, U.P.
10	M/s Magadh Sugar & Energy Limited, Unit – Hasanpur, Bihar.
11	M/s Triveni Engineering & Industries Ltd., Unit – Sabitgarh, District – Bulandshahar, U.P.
12	M/s Bajaj Hindusthan Sugar Limited, Unit – Gangnauli, District – Shahjahanpur, U.P.

13	M/s Bajaj Hindusthan Sugar Ltd., Unit – KhambharKhera, District – Lakhimpur Kheri, U.P.
14	M/s Bajaj Hindusthan Sugar Limited, Thana Bhawan, District – Shamli, U.P.
15	M/s Harinagar Sugar Mills Limited, Harinagar, District – West Champaran, Bihar.
16	M/s Bajaj Hindusthan Sugar Mills Limited, Unit – Palia Kalan, District – Kheri, U.P.
17	M/s Avadh Sugar & Energy Limited, Unit – Hargaon, District – Sitapur, U.P.
18	M/s Upper Doab Sugar Mills, District – Shamli, U.P.
19	M/s L.H. Sugar Factories Limited, District – Pilibhit, U.P.
20	M/s Indian Potash Limited, Unit – Rohana Kalan, District – Muzaffarnagar, U.P.
21	M/s Bajaj Hindusthan Sugar Limited, Unit – Kundarkhi, District – Gonda, U.P.
22	M/s Dalmia Bharat Sugar & Industries Unit – Nigohi, District – Shahjahanpur, U.P.
23	M/s DCM Shriram Limited, Distillery Unit – Ajbapur, District – Lakhimpur Kheri, U.P.
24	M/s Dalmia Bharat Sugar & Industries Limited, Unit – Jawaharpur, District – Sitapur, U.P.
25	M/s Malbros International Private Limited, District – Ferozepur, Punjab.
26	M/s Om Sons marketing Private Limited, Bathinda, Punjab.
27	M/s Balrampur Chini Mills Limited, Unit – Akbarpur, U.P.
28	M/s Avadh Sugar & Energy Limited, Unit – Seohara, District – Bijnor, U.P.
29	M/s HPCL Biofuels Limited, Unit – Sugauli, District – East Champaran, Bihar.
30	M/s HPCL Biofuels Limited, Unit – Lauria, District – West Champaran, Bihar.
31	M/s Triveni Engineering & Industries Limited, Unit – Chandanpur, District – Amroha, U.P.
32	M/s DCM Shri Ram Limited, Sugar Unit – Ajbapur, District – Shahjahanpur, U.P.
33	M/s Tikaula Sugar Mills Limited, District – Muzaffarnagar, U.P.
34	M/s Tikaula Distillery, District – Muzaffarnagar, U.P.
35	M/s Bajaj Hindusthan Sugar Limited, Unit – Utraula, District – Balrampur, U.P.
36	M/s Triveni Engineering & Industries Ltd., Unit – Rani Nangal, District – Moradabad, U.P.
37	M/s Balrampur Chini Mills Limited, Unit - Balrampur, U.P.
38	M/s K.M. Sugar Mills Limited, Masaudha, District – Ayodhya, U.P.
39	M/s Vishwaraj Sugar Industries Limited, District – Belagavi, Karnataka.
40	M/s The Shahabad, Co-operative Sugar Mills Limited, District – Kurukshetra, Haryana.
41	M/s Dalmia Bharat Sugar & Industries Limited, Unit – Jawaharpur, District – Sitapur, U.P.
42	M/s Magadh Sugar & Energy Limited, Sidhwalia Gopalganj, Bihar.
43	M/s Balrampur Chini Mills Limited, Unit – Maizapur, District – Gonda, U.P.
44	M/s The Seksaria Biswan Sugar Factory Limited, Biswan, District – Sitapur. U.P.

45	M/s Uttam Sugar Mills Limited, Distillery Division, Barkatpur, District – Bijnor, U.P.
46	M/s Jaywant Sugars Limited, Satara, Maharashtra.
47	M/s Bajaj Hindusthan Sugar Limited, Unit – Rudhauli, District – Basti, U.P.
48	M/s Bajaj Hindusthan Sugar Ltd., Unit – Khambharkhera, Distt. – Lakhimpur Kheri, U.P.
49	M/s EID Parry (India), District – Srikakulam, Andhra Pradesh.
50	M/s Balrampur Chini Mills Limited, Babhnan, District – Gonda. U.P.
51	M/s Wave Sugar & Industries Limited, Dhanaura Mandi, District – Amroha, U.P.
52	M/s Simbhaoli Sugars Limited, Brijnathpur, District – Hapur, U.P.
53	M/s Mawana Sugar Works Mawana, District – Meerut, U.P.
54	M/s Dalmia Bharat Sugar & Industries Ltd., Sugar Unit -Ramgarh, District – Sitapur, U.P.
55	M/s Dalmia Bharat Sugar & Industries Ltd., Distillery Unit-Ramgarh, District – Sitapur, U.P.
56	M/s Uttam Sugar Mills Limited, Sugar Unit – Barkatpur, U.P.
57	M/s Bajaj Hindusthan Sugar Limited, Maqsoodapur, District – Shahjahanpur, U.P.
58	M/s Balrampur Chini Mills Limited, Babhnan (Chemical Division) District – Gonda, U.P.
59	M/s Balrampur Chini Mills Limited, Gularia, District – Lakhimpur Kheri, U.P.
60	M/s Balrampur Chini Mills Ltd., Unit – Tulsipur, District – Balrampur, U.P.
61	M/s DCM Shri Ram Limited, Sugar Unit – Hariawan, District – Hardoi, U.P.
62	M/s DCM Shri Ram Limited, Sugar Unit – Rupapur, District – Hardoi, U.P.

ANALYTICAL SERVICES:

Besides analysis of sugar & sugar house products, Ethanol and effluents etc. Institute started offering testing of Ethyl Alcohol based Sanitizer in its sophisticated, most modern NABL & BIS accredited analytical laboratory and other laboratories of the institute. Testing of bagasse for determination of GCV also taken up during the period. Analytical services were rendered to following:

1	M/s The Kisan Sahkari Chini Mills Ltd., Satha, Aligarh, U.P.
2	M/s The Kisan Sahkari Chini Mills Ltd., District - Budaun, U.P.
3	M/s Danteshwari Maiya SSK Maryadit, Balod, Chhattisgarh.
4	M/s The Kisan Sahkari Chini Mills Limited, Pilibhit, U.P.
5	M/s Triveni Engineering & Industries, Unit – Khatauli, U.P.
6	M/s Triveni Engineering & Industries, Unit – Deoband, U.P.
7	M/s Kisan Sahkari Chini Mills Limited, Lakhimpur Kheri, U.P.
8	M/s The Ganga Kisan Sahkari Chini Mills Limited, Morna.
9	M/s L.H. Sugar Factories Limited, Pilibhit, U.P.
10	M/s Simbhaoli Sugars Limited, Unit – Chilwaria, Bahraich, U.P.

11	M/s Triveni Engineering & Industries, Deoband, Saharanpur, U.P.
12	M/s Dalmia Bharat Sugar & Industries Limited, Nigohi.
13	M/s HPCL Sugar, East Champaran, Bihar.
14	M/s Kisan Sahkari Chini Mills Limited, Badaun, U.P.
15	M/s Sarjoo Sahkari Chini Mills Limited, Belrayan, Kheri, U.P.
16	M/s Balrampur Chini Mills Limited, Unit – Kumbhi, District - Lakhimpur Kheri, U.P.
17	M/s HPCL, Biofuels Limited, Lauriya, District - East Champaran, Bihar
18	M/s Triveni Engineering & Industries Limited Unit – Khatauli, U.P.
19	M/s Triveni Engineering & Industries Limited, Unit – Deoband, U.P.
20	M/s Dhampur Sugar Mills, Unit - Meerganj, Bareilly, U.P.
21	M/s Dhampur Sugar Mills, Unit - Asmoli, District - Moradabad, U.P.
22	M/s Dhampur Sugar Mills, Unit - Dhampur, District – Bijnor, U.P.
23	M/s Dhampur Sugar Mills, Unit - Rajpura, District – Sambhal, U.P.
24	M/s Balrampur Chini Mills Ltd., Unit – Gulariya, Lakhimpur, U.P.
25	M/s The Kisan Sahkari Chini Mills Ltd., Kaimganj, District – Farrukhabad, U.P.
26	M/s The Kisan Sahkari Chini Mills Ltd., Sathiaon, District – Azamgarh, U.P.
27	M/s The Ugar Sugar Works Limited, Kalburagi, Karnataka
28	M/s The Ramala Sugar Mills Limited, Bagpat, U.P.
29	M/s Balrampur Chini Mills Limited, Unit - Akbarpur, U.P.
30	M/s Triveni Engineering & Industries Limited, Rani Nangal, U.P.
31	M/s Kisan Sahkari Chini Mills Limited, Semikhera, Bareilly, U.P.
32	M/s Magadh Sugar & Energy Limited, Sidhwalia, Bihar
33	M/s Avadh Sugar & Energy Limited, Hargaon, Sitapur, U.P.
34	M/s Gobind Sugar Mills Limited, Lakhimpur Kheri, U.P.
35	M/s Daurala Sugar Mills Limited, District - Meerut, U.P.
36	M/s Balrampur Chini Mills Limited, Babhnan, U.P.
37	M/s The Kisan Sahkari Chini Mills Limited, Anoopshahar, Bulandshahar, U.P.

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OUR OTHER ACTIVITIES:

1. राष्ट्रीय शर्करा संस्थान, कानपुर में 2 अक्टूबर 2021, गांधी जयंती के अवसर पर भारत माँ के दो महान सपूतों, **राष्ट्रपिता महात्मा गाँधी** और **प. लाल बहादुर शास्त्री** को नमन किया गया । संस्थान द्वारा इस अवसर पर आयोजित कार्यक्रम मे स्वछता मिशन के अंतर्गत मास्क एवं कपड़े के झोलों का वितरण गया।



2. Director, National Sugar Institute, Kanpur was awarded by two Gold Medals during 79th Annual Convention of STAI, "**Dr. P J Manohar Rao Gold Medal**" for carrying out significant work on value addition through use of by-products in an innovative manner and "Noel Deerr Gold Medal" for the research paper on production of alkyl levulinates from bagasse on 4th -5th October, 2021.

3. "**Campus Recruitment**" was carried out at NSI, Kanpur during the period. Interviews were conducted by M/s Balrampur Chini Mills Ltd., M/s Dhampur Sugar Mills Ltd., M/s Renuka Sugar Mills Ltd., M/s DCM Shriram Ltd., & M/s Triveni Engineering & Industries Ltd. etc. In addition to them various reputed chemical and machinery manufacturing companies such as M/s Catalyst Bio technologies, M/s VRL Automation and Spray Engineering Devices Ltd. also recruited students of various courses.



4. Shri Sudhansu Pandey, Secretary (Food & Public Distribution) Government of India, visited National Sugar Institute, Kanpur on 11th October 2021 and inspected various academic, research and other activities. He also discussed the road map for taking institute forward. He also chaired a meeting with Sugar Industry representatives on issues of pending cane payments, ethanol blending and multiple other issues of value addition.



5. The "**Conventional Khandsari Unit**" of National Sugar Institute, Kanpur, lying closed since 1984 to be revived. It shall be utilized for running short duration training programmes on Khandsari and Jaggery production. Training to focus on production of various kinds of Jaggery viz. cube, cream, liquid, fortified etc. and also on jaggery based bakery and confectionary products.



6. Hon'ble Minister of State, Consumer Affairs, Food & Public Distribution and Rural Development, Government of India, Sadhvi Niranjan Jyoti, reviewed the working of National Sugar Institute, Kanpur on 19th October 2021. Prof. Narendra Mohan, Director, National Sugar Institute, Kanpur detailed her about the current teaching, research and consultancy activities of the institute.



7. Director, National Sugar Institute, Kanpur attended Annual General Meeting of UP Sugar Mills Association on date 20th October 2021 and addressed on issues related to Co-generation of power and value addition by the Indian sugar industry.

8. Director National Sugar Institute, Kanpur, was conferred Life Time Achievement Award by "Deccan Sugar Technologists Association" (DSTA) on 30th October 2021 for his long and outstanding services to the sugar industry.

9. A presentation on "Sugar industry - A Potential Hub for Bio-Energy" was made by Director, National Sugar Institute, Kanpur during the XV Agricultural Science Congress & ASC Expo BHU Varanasi, UP on 15th November 2021.

10. आज़ादी के अमृत महोत्सव के अंतर्गत एवं महान वैज्ञानिक भारत रत्न व नोबल पुरुस्कार विजेता सी वी रमन की जयंती पर एक विचार गोष्ठी "देश के चीनी उद्योग की आत्मनिर्भरता मे टेक्नोलॉजी का महत्व" विषय पर आयोजित की गयी। इस गोष्ठी मे संस्थान के विषय विशेषज्ञों के अतिरिक्त देश के अनेक वैज्ञानिको एवं विशेषज्ञों ने भी भाग लिया।

11. National Sugar Institute Kanpur organized meeting with faculty of Chhatrapati Shahu Ji Maharaj University, Kanpur University (CSJM), faculties under the Chairmanship of Director, NSI to plan for collaborative research on development of bio-lubricants, fortified sweeteners and other value added products.

12. राष्ट्रीय शर्करा संस्थान की छात्र क्रिया परिषद की ओर से दिनांक 12 नवंबर को परिसर में निशुल्क स्वास्थ शिवर का आयोजन किया गया। शिविर में डॉ. विपिन श्रीवास्तव, डॉ. रोहित तिवारी, डॉ. निधिका पांडेय एवं डॉ नमन कनोडिया ने मरीजों की जाँच की और मुफ्त में दवाये दी। शिविर में छात्र-छात्राएं, शिक्षक, कर्मचारियों, के अलावा आसपास के लोगों ने भी भाग लिया. शिविर में आये हुये लाभार्थियों को मुफ्त मास्क का वितरण भी किया गया।

13. Under the auspices of Scientific Society, Council of Students Activities, National Sugar Institute, Kanpur Annual Sports were organized during the period. Prize distribution for Annual Sports was made on 13th November 2021 by the Director.

14. Students of ANSI (Sugar Technology) course visited the institute farm for learning technique of conducting "**Pre-harvest Cane Maturity Survey**" so to harvest cane at

optimum maturity & also about importance of crop rotation. Students also discussed about the harvesting of sugarcane at optimum maturity and post harvest management.



15. Director NSI, Kanpur, addressed a webinar on the topic "**Indian Sugar Industry: Striving to Achieve Environmental Sustainability**" on the National Pollution Control Day on 2nd December 2021.

16. Director National Sugar Institute, Kanpur visited to M/s Balrampur Chini Mills Ltd., Unit – Tulsipur, Balrampur to inaugurate their power export unit, commencement of crushing season as well.



17. A workshop for creating awareness on "**Sexual Harassment of Women at Workplace**" was conducted at National Sugar Institute, on 9th December 2021. In his initial remarks, Shri Brajesh Kumar Sahu, Senior Administrative Officer informed about the various provisions contained in the Prevention, Prohibition and Redressal Act 2013 to safe guard the interest of women while working protecting her dignity, upholding right

of fundamental equality and right to working in a safe environment. Director called upon the participants to work together in a cordial atmosphere maintaining dignity and decorum.



18. Students of BND College, Kanpur visited various laboratories of the institute and also the Experimental Sugar Factory to seek first-hand information about unit operations and got insight of courses and employment opportunities in sugar industry.



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HAPPENING IN THE SUGAR INDUSTRY:

Thai Sugar Production is expected to resume.

The Thai sugar market is eyeing a return to strength in 2022 after two consecutive years of drought, but will likely face logistical challenges in securing freight to export its surplus supply to buyers in the region as well as competition from cargoes from India and Brazil. It is reported by S&P Global Platts.

Thailand's crop prospects for the marketing year 2021-22 (October- September) are expected to improve after increased rainfall in September, and expectations for production for the year range from 9.5 million tonnes to 11 million tonnes. S&P Global Platts Analytics estimates Thailand cane production for MR 2021-22 at 95 million tonnes and sugar production at 10.5 million tonnes. Thailand's MR 2021-22 sugar exports are forecast to rise by 3.8 million tonnes to 7.5 million tonnes.

Brazil's Center-South sugar output set to shrink 67%

Sugar production in the second half of November in Brazil's key Center-South region is expected to total 142,000 tonnes, a 67% drop from the same time a year ago. It is reported by S&P Global Platts. Reduced sugar production can be mostly attributed to the second consecutive year of belowaverage rainfall in the region, as well as frost and a lack of renew in the planting area, which all combined resulted in a drop in the agricultural yield and volume of cane crushed.

Market participants estimated that most producers from the region will conclude the 2021-22 crushing season in mid-November. The amount of sugarcane crushed in H2 November is expected to total 3,4 million tonnes, down 61,4% from the prior-year period, according to the survey.

If analyst estimates prove correct, it will be the lowest volume of sugarcane crushed in any H2 November since the 2002-03 crop, when 1,97 million tonnes were crushed in the same period.

Top sugar companies in Uttar Pradesh diversifying into alcoholic drinks sector.

A lucky mix of regulation and business opportunity has paved the way for some of India’s largest sugar and chemical manufacturers, including Triveni Engineering, DCM Shriram, Dhampur Sugar Mills and India Glycols Ltd (IGL), to enter the liquor business, according to local press reports.

Forecast 2021/22 sugar output of 2.1 million tonnes bolstered with imports of 100,000 tonnes, says USDA.

Raw sugar production for 2021/2022 (September-August) is estimated at 2.1 million tonnes, 2% lower than the previous year, according to the latest United States Department of Agriculture’s (USDA) attaché report.

Bangladesh cuts sugar import duties to curb rise in domestic prices.

According to notifications from the National Board of Revenue (NBR), the customs authority reduced import tariff on raw sugar to contain price rises.

India loses dispute at WTO over sugar subsidies brought by Brazil, Australia and Guatemala.

India has lost the dispute over its subsidies on sugar exports at the World Trade Organization (WTO), brought by Brazil, Australia and Guatemala, Valor Economic reported.

US$3.37 billion tax imposed on 69 sugar mills following a government audit.

Following the completion of a five-year tax audit of 69 sugar mills by the Federal Board of Revenue (FBR), they have been slapped with a tax of about PKR588 billion (US$3.37 billion) as well as a fine of PKR42 billion for cartelisation, adviser to the Prime Minister on Interior and Accountability Shahzad Akbar said at a press conference.

Steptoe & Johnson to lobby for the Brazilian sugar industry at the COP 26 event.

The U.S. lobbying firm Steptoe & Johnson LLP has disclosed that it will work for the Brazilian sugar industry group Unica on matters tied to the upcoming United Nations climate change conference COP 26 in Glasgow, UK, reported Reuters.

'Containergeddon': Shippers switching to bulk vessels to export sugar.

Food traders are switching from containers back to dry bulk vessels to transport refined sugar and rice to avoid shipping delays caused by container shortages and port congestion that the industry calls "containergeddon", reported Reuters.

LanzaTech partners with SED to produce bagasse-based ethanol.

Spray Engineering Devices (SED), a multidisciplinary engineering company, is partnering with LanzaTech in the first-of-its-kind bagasse to ethanol project in India.

Covid pandemic and weather reduces Ledesma's sugarcane production by 11%.

Argentina's largest sugar producer Ledesma milled 11% less cane in 2020/21 than in the previous year, mainly due to the combination of the pandemic and inclement weather, according to local press reports.

Indonesia – Kapal Api to build a new cane sugar factory in Maluku Islands.

Kapal Api, one of the top coffee producers in Indonesia, is investing in a new cane sugar factory in the Maluku Islands, according to a press release from BMA who is supplying the technology.

Parliament approves generous support measures to sugar industry to last until 2026.

The Swiss Parliament recently approved an extension of the support measures for domestic sugar beet cultivation until 2026 to check the decline of the sugar industry.

Al Khaleej Sugar plans to invest US$2 billion in sugar factory complex.

Dubai-based Al Khaleej Sugar Co. (AKS) plans to invest US$2 billion (IDR26.66 trillion) to build a new sugar factory along with a cogen unit and an ethanol plant, according to local press reports.

DCM Shriram investing over US$48 million to expand milling capacity and add backend refineries.

Chemicals, sugar, and fertilizers company DCM Shriram announced on 8th November that it is planning an investment of over INR3.58 billion (US$48.3 million) to expand capacity at of one of its sugar mills and one ethanol plant as well as add a couple of backend refineries, according to local press reports.

Raizen's profit doubles in Q2 2021/22 despite reduced cane output.

The sugar and ethanol producer and fuel distributor Raizen reported that its adjusted net income more than doubled BRL1.1 billion (US$201.5 million) in the second quarter of the crop year 2021/22 compared to the same period last year, reported Reuters.

Algeria to introduce 9% VAT on sugar to cut imports.

Algeria will impose a 9% value-added tax on white and raw sugar from early next year to reduce imports and address health issues, Prime Minister Aymen Benabderrahmane confirmed recently, according to local press reports. Algeria imports sugar to meet its domestic requirement.

Prime Minister will inaugurate track, trace system in sugar mills.

Prime Minister Imran Khan inaugurated the rack and trace system of the Federal Board of Revenue (FBR) for the sugar industry on November 23 when the 2021/22 campaign commences, according to local press reports. The prices of sugar in Pakistan are ruling high during the year.

American Crystal Sugar's beet growers paid US$60/t for their crops.

American Crystal Sugar Co. management recently announced to shareholders that they'd receive hefty payments of more than US$60 per ton for both the 2020 and 2021 crops.

US Sugar's proposed acquisition of Imperial Sugar blocked by Justice Department.

The Department of Justice filed a civil antitrust lawsuit on 23rd November to stop United States Sugar Corporation (U.S. Sugar) from acquiring its rival, Imperial Sugar Company (Imperial Sugar).

Sugar industry restructured amidst falling output.

Cuba has carried out a root and branch restructure of its sugar industry in a last-ditch attempt to keep mills from folding in the face of collapsing output, reported Reuters.

Sosucam assures the local market that it can sugar for domestic needs.

The Société sucrière du Cameroun (Sosucam), a subsidiary of French Somdiaa, has assured the local market that sugar will be available in sufficient supply for the holiday period, the upcoming African Cup of Nations, and even till the end of 2022, according to a press release.

Zero-sugar Oreos not to consumers liking.

Initial reaction from the launch of Oreo Zero sugar-free cookies in China some three months ago has been disappointing, Mondelez International Inc's CEO admitted, reported Reuters.

Sustainable farming must not embrace 'one size fits all solution'.

Sustainable agriculture will not be achieved by one universal solution. A meta-analysis by the University of Basel shows that the current focus on no-till farming does not achieve the desired results. A sustainable agriculture system must be designed for local needs and in dialogue with local farmers.

Pfeifer & Langen investing over US$24 million on several projects at its Miejska Górka sugar factory.

Pfeifer & Langen Polska S.A. recently announced an investment of PLN100 million (US$24.5 million) for several projects at its Miejska Górka Sugar Factory.

AFC injects US$200 million in BUA Groups new build sugar project.

Africa Finance Corporation (AFC), Africa's leading infrastructure solutions provider, has approved a US$200 million to complete BUA Group's vertically integrated sugar facility in Lafiagi, Kwara State, Nigeria.

Sugar sector in Minas Gerais investing over US$1 billion to expand cane production.

The cane sector in Minas Gerais will invest BRL6 billion (US$1.07 billion) to expand crushing capacity over the next eight years to over 95 million tonnes (mln t), when it is expected to become the second-largest producing state, behind only São Paulo.

Sugar millers protest against paying cane growers extra for waste streams.

On November 15, 2021, Mr Siriwut Siemphakdi, Executive Vice President of Thai Sugar Miller Company Limited (TSMC) and chairman of the Public Relations Working Group, revealed that the 3 Sugar Mill Associations representing 57 sugar factories resigned from the committee pushing through the draft amendment to Section 4 of the Cane and Sugar Act, BE 2527 (1984).

Pyrrhic victory for Brazil et al as India loses sugar subsidies dispute at WTO.

India lost the dispute over providing excessive domestic support and export subsidies for sugar and sugarcane at the World Trade Organization (WTO). The dispute settlement panel ruled against the country on a complaint that Brazil, Australia, and Guatemala had filed. The announcement of the ruling was made on 14 December.

Ecobank and Proparco seize Mumias Sugar's key assets.

Pan-African lender Ecobank and French development financier Proparco have seized the prime assets of the debt-ridden miller Mumias Sugar from KCB Group, setting the stage for a vicious court battle that could throw the planned leasing of the ailing miller into disarray

Australian Cane Farms to expands its ownership of farmland through injection of AU$55 million.

Sugarcane farm aggregator Australian Cane Farms (ACF) is poised to become one of the country's biggest independent cane growers after it raised AU$55 million (US$39 million) to buy a 2100-hectare portfolio of farms in Queensland's fertile Burdekin region.

Nigerian government funds irrigation infrastructure to expand cane production to the tune of US$73 million.

To drive expansion in sugarcane production in the country, the government is to inject US$ 73 million for the development of irrigation infrastructure, Niyi Adebayo, minister of industry, announced on 20th December at a formal gathering.

Sarrai Group secures 20-year lease to run Mumias Sugar.

Uganda-based Sarrai Group secured a 20-year lease for assets of the ailing Mumias Sugar Company and consequently the mandate to revive the collapsed miller, having emerged winner of the bidding that lasted over four months, the miller's receiver-manager Pongangipalli Venkata Ramana Rao has disclosed.

USDA increases 2022 allocation for locally produced sugar by over 390,000 tonnes.

For the fiscal year (FY) 2022, the United States Department of Agriculture (USDA) revised and increased overall sugar marketing allotment quantity (OAQ) by 432, 657 short tons raw value (STRV, 392,500 metric tonnes) on December 22 – now totalling 10,802,657 STRV — which is divided between beet (54.35%) and cane sugar (45.65%).

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RESEARCH ARTICLE:

"Diversion of Process intermediates such as BH / partial syrup to Ethanol & related changes in Evaporator configuration to achieve it ,along with updated Ethanol economics"

by

Sura K Bhojraj
Consultant, Pune

ABSTRACT :

Considering present day need to boost ethanol production ,which enable ethanol blending with petrol.There will be a deficit of over 2.6 billion liters in 2022, if we were to achieve 10% ethanol blending & through molasses route only.The new policy of Govt.of India allows Ethanol production from BH molasses,sugar cane juice, syrup, sugar Beet, sweet sourghum, corn, cassava, rotten potatoes, & rotten food grain etc, which is unfit for human consumption. Further Govt of Idia announced revised prices of BH molasses (fixed the norms of BH & yield of Ethanol from BH molasses) & also revised the norms of Sugar cane syrup & yield of Ethanol from Syrup. Rs 59.08 /liter in case of Ethanol produced from BH & Rs 63.45 /liter in case of Ethanol produced from Syrup. In case of A grade molasses 260 @ 10% Total reducing sugars (rate Rs 46.66/liter)

We have chosen a standard Sugar plant producing Raw sugar & having back end refinery. In first case, it is two massecuite boiling & resulting BH sent to Ethanol. In second case part of syrup is diverted to Ethanol & the remaining to regular three massecuite boiling & back end refinery.

Key words : Pr (pressure), Temp. (Temperature), H.S.A (heating surface area) PHE (Plate type Heat exchanger), FFE (Falling film Evaporator), TCD (Tonnes crushed /day), BH (B heavy molasses), CH (C heavy molasses)

INTRODUCTION :

An interesting exercise is done in case 7000 TCD plant producing Raw sugar & integral Refinery. All the above routes are chosen.

Regular calculation of Evaporator configuration is carried out, based on bleeding pattern for juice heating as mentioned. 3rd vapours are used for Raw massecuite boiling & 2nd vapours for Refinery massecuite. Various steam economy measures are adapted.

In both the cases Raw sugar production with back end refinery is followed. In case of Sugar produced & alcohol produced (both in the season & off season). Partial syrup route is benefitial. About 30 % more product value than other route of BH diversion.

Text of the paper : In two parts (I & II) : A & B

A) METHODOLOGY OF EVAPORATOR CALCULATIONS :

I) Target crushing rate 7000 TCD, with two massecuite boiling (A &B) & BH diversion to Ethanol making. The syrup goes for A & B massecuite boiling

II) Target crushing rate 7000 TCD, up to Evaporator station & then Syrup quantity corresponding to 2000 TCD is diverted to Ethanol making. Remaining syrup goes for 3 massecuite boiling. Then the resulting CH also goes for Ethanol production.

Falling film evaporators are considered for first three effects of Quintuple & Vertical continuous pans for A, B & C boiling.

I) To Ethanol making :

Corresponding Target crushing rate 7000 TCD, with two massecuite boiling (A & B) & BH diversion calculation in case of Quintuple with suggested bleeding & operating conditions in case of 7000 TCD plant:

Crushing capacity: (7000/22 hrs/319 TCH)

M.J % Cane : 101.09 : 322.47 T/Hr, Fibbre % cane 15.35, A.W % cane 33.39

Imbibition % Fibre 217.52

Filtrate returns 10%: 31.90 T/Hr

Total load to JH's : 354.37 TCH (111.09% on cane)

Cl.J% Cane 100% on cane: 319 T/hr.Brix 14.0, Cp (Sp.heat considered 0.92)

Syrup Brix : 68.00 : % Evaporation: 79.41

Massecuite % cane : A- 28/B-13/C-7 (48 % on cane) in case of three massecuite boiling. A-26 % on cane & B- 17.5 % (43.5% on cane)in case of 2 massecuite boiling.

Refined massecuite % cane : R1- 14/R2- 10/R3 -2.55 For 2 massecuite boiling

R1-15/R2- 10/R3-3.55 % cane for 3 massecuite boiling

Exh. Condition :1.00 kg/cm^2.g @ 120 deg C & vacuum in last body @ 0.2 kg/cm^2.g (60 deg C)

As per factory conditions ,the last body vacuum is @ 620 mm (0.1866 bar) but taken 0.2 bar considering boiling point elevation .

Pressure & Temp.across each body in case of quintuple set

Exh.at 2.00 kgs/cm^2.abs (120 deg C) & Last body @ 0.2 kg/cm^2.abs (60 deg C)

Details	**Exh.Pr**	**1st**	**2nd**	**3rd**	**4th**	**5th**
Kg/cm^2/abs	2.00	1.604	1.226	0.866	0.524	0.20
Temp.Deg C	120	113.50	105	95.50	82.50	60
Latent heat Kcals/kg	526.8	531.30	536.75	542.94	550.70	564.20

Bleeding pattern :

R.J Initial heating : 35 to 52 deg C by condensate cross heating .

R.J final/ correction heating from 52 -72 deg C by 4th body vapours by Dynamic Juice heater : 10775Kgs/hr

Juice load to Defecated juice heating : 354370 kgs/hr

D.J 1st heating from 70-82 deg by 3rd vapour: Kgs/hr//7206

D.J 2nd heating from 82 to 92 deg by 2nd vapours = 6074 kgs/hr

D.J 3rd heating from 92 to 104 by 1st vapours (DCH) = 7234 Kgs/hr

Juice load to Clarifier : 354370+ 7234 = 361604 kgs/hr (113.36 % on cane)

From there flash losses (0.8%) 2552 kgs, underflow (12%) 38280 kgs/hr taken out. Added Bagacillo (0.8%) 2552 kgs. So clear juice coming out from Clarifier is 375961-1824+1824 -38280 =323324 kgs/hr 101.36 %

CL.J 1st heating by 2nd vapours 95 to 100 deg C by PHE = 2771 kgs/hr

Cl. J 2nd heating by 1st vapour 100 to 111 deg C by DCH = 6130 kgs/hr

Clear juice load to Evaporators :

323324 + 6130 = 329454 kgs/hr (103.27 %) @ 13.56 Bx

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

Because BH is diverted, it is only 2 massecuite boiling ,accordingly

Avg Brixes considered : A – 89, B – 92 (Raw massecuites)

Similarly the Brixes of intermediate molasses: AL :75, AH -75, BH 75.5

Vapour requirement for boiling Raw massecuite pans: For A 0.275 kgs vapour / kg of masscuit, for B 0.20 kgs/kg

We have to consider the vapours required corresponding to 7000 TCD

319000 x 0.275 x 0.26 = (22808 kgs/hr) for A –Massecuite (7.15 % on cane)

319000 x 0.2 x 0.175 = 11165 kgs/hr for B massecuite (3.50 % on cane)

3rd effect vapour for A ,B – boiling 33973 Kgs/hr (10.65 % cane)

Average Brix considered for Refinery massecuite 88-89

Refined massecuite boiling :R1-14/R2 -10/R3-2.55 –(26.55% on cane)

Vapour requirement for Refinery batch pans: For R1 0.30 kgs vapour / kg of masscuite, for R2 0.16 kgs/kg & for R2 0.17 kgs/kg. Batch pans with Mechanical circulators are considered.

319000 x 0.14 x 0.3 = (13398 kgs/hr) for R1 –Massecuite (4.20 %on cane)

319000 x (010) x 0.16 = 5104 kgs/hr for R2 massecuite (1.60 % on cane) 319000 x 0.0255 x 0.17 = 1383 kgs/hr for R3 massecuite (0.4335% on cane)

2nd effect vapours for R1, R2 & R3 – boiling 19885 Kgs/hr (6.23 % cane)

Pan washing : 0.5 % cane 1595 kgs/hr by 2nd vapours

Seed melting by 1st vapours 1.0%, 3190 kgs/hr

Molasses conditioning by 3rd vapours, 0.5%1595 kgs/hr

Melt heater 1754 kgs/hr by by 2nd effect vapour (0.55 % on cane)

Melt concentrator by double effect: Melt quantity 38514 kgs/hr

Evaporation 38514 x (75-65)/75 = 5502 kgs /hr

In case of double effect 5502/2 = 2751 kgs/hr by 2nd vapour (0.86% on cane)

Steam for drier by 1st vapour : 0.1% = 319 kgs/hr

C/F washing by by 1st vapour 0.2 % = 638 kgs/hr

Total Evaporation in Quintuple :

329454 (68- 13.56) /68 = 263757 (80.34 %) kgs/hr. Syrup Quantity = 65697 kgs/hr (20.60 %)

E = 263757 kgs/hr = 5x + 4 (10775) + 3 (7206+ 33973+1595) + 2 (19885+ 6074 +1754+2751+1595+ 1817) + 7234+6130+ 3190+319 +638

X = 1414 kgs/hr (0.443 % on cane)

Corresponding evaporation in kgs/hr in Quintuple :

I 106350 ,II 88839 ,III 54963 , IV 12189 ,V 1414 kgs/hr

Exh. requirement 106350 kgs/hr.(33.34 % on cane)

Condensate flash recovery advantage :minimum 2.0% on cane

Net evaporator station steam consumption: 99970 kgs/hr (31.34)

Misc (1.0% on cane) = 3190 kgs/hr

High pr. & low pr. Losses (1.0 % on cane) = 3190 kgs/hr7

Total estimated steam % cane = 106350 kgs/hr (33.34 % on cane) i.e 33.5 % on cane excluding distillery .

H.S.A 's considered: (based on regular procedure of working out of avg. Brixes, Boiling point elevations & effective ΔT, Sp.heat transfer coeffcients) **;Refer Annexure I**

Average Brixes in this case :I- 16.79/II -26.65/III- 44.83/ IV –61.48/V – 67.28 respectively

3600 FFE/3600FFE/3600 FFE/ 1400 R/ 400 R = 12600 m^2. *Ratio H.S.A/T.C.D=1.80 m^2/TCD.3560 FFE as floating for I & II &III, 1400 R Stand by for IV,400 R as stand by for V

The ratio is on higher side because, considering the usage of FFE sets (because one has to consider the recirculation of juice into consideration) ..

Evaporation rates : 29.54/ 24.67/ 15.27/8.71 / 5.65 kgs/m^2/hr

II) *Target crushing rate 7000 TCD, up to Evaporator station & then Syrup quantity corresponding to 2000 TCD is diverted to Ethanol making.*

Corresponding calculation in case of Quintuple with suggested bleeding & operating conditions in case of 7000 TCD plant:

Crushing capacity: (7000/22 hrs/319 TCH)

From here (basic data) to Clear juice load to evaporators is common with case I.Hence the repetition is omitted ----

Clear juice load to Evaporators :

323324 + 6130 = 329454 kgs/hr (103.27 %) @ 13.56 Bx

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

Avg Brixes considered : A – 89, B – 92, C- 95 (Raw massecuites)

Similarly the Brixes of intermediate molasses: AL-75, AH -75, BH 75.5, CL-75

Vapour requirement for pans Raw massecuite boiling : For A 0.275 kgs vapour / kg of masscuite ; for B 0.20 kgs/kg & for C 0.20 kgs/kg.

We have to consider the vapours required corresponding to 5000 TCD

228000 x 0.275 x 0.28 = (17556 kgs/hr) for A –Massecuite (5.50 % on cane)

228000 x 0.2 x 0.13 = 5928 kgs/hr for B massecuite (1.86 % on cane)

228000 x 0.2 x 0.07 = 3192 kgs/hr for C massecuite (1.0% on cane)

3rd effect vapour for Raw A ,B & C – boiling 26676 Kgs/hr (8.36 % cane)

Average brix considered for Refinery massecuite 88-89

Refined massecuite boiling :R1-15/R2 -10 /R3-3.55 –(28.55% on cane)

Vapour requirement for pans : For A 0.30 kgsvapour / kg of masscuite ; for B 0.16 kgs/kg & for C 0.17 kgs/kg. Batch pans with Mechanical circulators are considered.

228000 x 0.15 x 0.3 = (10260 kgs/hr) for R1 –Massecuite (3.216 on cane)

228000 x 0.10 x 0.16 = 3648 kgs/hr for R2 massecuite (1.1435% on cane)

228000 x 0.0355 x 0.17 = 1376 kgs/hr for R3 massecuite (0.431 on cane)

2nd effect vapour for R1, R2 & R3 – boiling 15284 Kgs/hr (4.79 % cane)

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

Seed melting by 1st vapours 1.0%, 2280kgs/hr

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

Melt heater 1266 kgs/hr by by 2nd effect vapour (0.55 % on cane)

Melt concentrator by double effect: Melt quantity 27257 kgs/hr

Evaporation 27257 x (75-65)/70 = 3634 kgs /hr

In case of double effect 3634/2 = 1817 kgs/hr by 2nd vapour (0.8% on cane)

Steam for drier by 1st vapour : 0.1% = 228 kgs/hr

C/F washing by by 1st vapour 0.2 % = 456 kgs/hr

Total Evaporation in Quintuple :

329454 (68- 13.56) /68 = 263757 (80.34 %) kgs/hr. Syrup Quantity = 65697 kgs/hr (20.60 %)

E = 263757 kgs/hr = 5x + 4 (10775) + 3 (7206+ 26676+1140) + 2 (15284+ 6074 +2771+1266+ 1817+ 1140) + 7234+6130+ 2280+228 +456

X = 8512 kgs/hr (2.67 % on cane)

Corresponding evaporation in kgs/hr in Quintuple :

I 98989, II 82661, III 54309, IV 19287, V 8512 kgs/hr

Exh. requirement 98989 kgs/hr. (31.03 % on cane)

Condensate flash recovery advantage: minimum 2.0% on cane

Net evaporator station steam consumption: 92609 kgs/hr (29.03)

Misc (1.0% on cane) = 3190 kgs/hr

High pr. & low pr. Losses (1.0 % on cane) = 3190 kgs/hr

Total estimated steam % cane = 98989 kgs/hr (31.03 % on cane) i.e 31.05 % on cane excluding Distillery.

H.S.A's considered: (based on regular procedure of working out avg. Brixes, Boiling point elevations & effective ΔT, Sp.heat transfer coeffcients)**; Refer Annexure I**

Average Brixes in this case: I- 16.47/II -25.81/III- 38.51/ IV – 52.59/V – 64.10 respectively

3500 FFE/3500FFE/3500 FFE/ 1600 R/ 1000R = 13100 m^2.*Ratio H.S.A/T.C.D=1.87 m^2/TCD, 13100/ 319 = 41.06 m^2/T.C.H

3500 FFE as floating for I, II & III, 1600 R stand by for IV,1000 R as stand by for V

The ratio is on higher side because, considering the usage of FFE sets (because one has to consider the recirculation of juice into consideration) ..

Evaporation rates : I -28.28/II-23.62/ III- 15.52/R- 12.05/R- 8.5 kgs/cm^2-hr

Operate conveniently as per requirement .

Enclosure : Common configuration of BH diversion /partial syrup diversion.

Observation & Remarks :

It is an honest assessment done as regards to Evaporator configuration, as per present day trend of BH diversion &, partial syrup diversion. Common configuration with inter changeability is also indicated .

The vapour consumption in case of partial syrup diversion is lesser than the case of BH diversion .

B) Recovery ,Ethanol yield data : Please refer Annexure Ia Ethanol Economics (attached sepsarately) :

In the tabulation A= respective sugar quantity A1-Syrup /molasses % cane x days of diversion, D =Total ethanol production B = Estimated yield liters /ton, © estimated overall recovery, E =Ethanol production during off season, Basis : Season days of 180 days are considered. Basis: cane 7000 TCD /24hours basis

Estimated yield liters /ton: in case of Syrup 290 @ 50 % fermentable sugars (rate Rs 63.45/lit) , In case of BH 310 @ 55 % fermentable sugars (rate Rs 59.08), In case of A grade molasses 260 @ 10 % Total reducing sugars (rate Rs 46.66) .F.M production w/o syrup diversion @ 90 brix /purity 42.81.

Further Syrup % cane multiplied by pol% will give sugar quantity in Syrup. This figure multiplied by 600 will give Ethanol yield .

Recovery figures are taken from Final Maufacturing report of 2020 -21 of the factory concerned.

Estimated loss % with 7000 tons crush rate 1.93. Estimated overall recovery 9.02 (Recovery % cane taken from R.T.8 (C) of corresponding factory. Good quality sugar Price Rs 33/kg

Explanation step by step : (Consider 60 Brix) & recalculate

1) Syrup diversion: Corresponding 2000 Tons/day is considered Quantity @ 20 MT/hour % on total cane crushed 6.86.
   Syrup % 20.58. For 2000 TCD /83.33 TCH. Syrup quantity 83.33 x 20.6/100 = 17.17 t/hr. rounded off to 20 T/hr (this is the quantity sent to Distillery).
   % on total cane crushed: (2000/7000) x 24 x 100 =6.86
   In the. tabulation Syrup @ 3 types of brixes 35/45/60 are considered for diversion. Here we consider 60 Brix.Irrespective of Brix variation the quantity will remain same.
   Corresponding Syrup quantity 20 x 24 x 180 = 86400 Tons/Season.

2) BH diversion 7000 x 0.0622 /24 = 18.14 T/hr **(6.22% based on Recovery calculation)**
   18.14 x 24 x 180 = 78372 Tons/ season.

3) FM diversion corresponding to 5000 TCD (7000 -2000) 0.0502 /24 =

   10.46 T/hr **(5.02% based on Recovery calculation)**

   10.46 x 24 x 180 = 45187 Tons/season.

4) FM production w/o syrup diversion 7000 x 0.0502 /24 = 14.64 T/hr

   14.64 x 24 x 180 = 63245 Tons/season

Estimated loss % with 2000 tons of cane : (2000 /7000) x 24 = 6.86

With 7000 tons 6.86 x 2000/7000 = 1.96 @ 35 Brix

@ 45 Brix Estimated loss with 2000 Tons of cane 6.86 x 45/35 = 8.82

With 7000 tons 8.82 x 2000/7000 =2.52

@ 60 Brix Estimated loss with 2000 Tons of cane 6.86 x 60/35 = 11.76

With 7000 tons 11.76 x 2000/7000 = 3.36

BH : Estimated loss % with 7000 tons crush cane: 6.22 x (Brix 88 x Purity 52.33)/(100 x 100) = 2.86

FM : Estimated loss % with 7000 tons crush cane 5.02 x (Brix 88 x Purity42.81)/(100 x 100) = 1.93

Estimated over all recovery based on last season figures { Recovery – Differrential loss (loss in Syrup -loss in F.M) = 9.02 – (1.96- 1.93) = 9.02- 0.03 = 8.99

Sugar quantity in Syrup = 20 x 24 x 180 = 86400 x Pol (Brix 35 x Purity 81.70)/(100 x 100)= 86400 x 0.28595 = 24706 @ 35 Brix

Sugar quantity in Syrup @ 45 Brix =24706 x 45/35 = 31765

Sugar quantity in Syrup @ 60 Brix = 31765 x 60/45 = 42353

Total Syrup quantity = 20 x 24 x 180 = 86400

BH diversion = 78372, Final molasses diversion 45187.

Refer enclosed assessment Annexure Ia, Para 2

Only BH Diversion :

Estimated over all recovery based on last season figures : 8.09

Total loss in recovery = 9.02- 8.09 = 0.93

Equivalent Sugar Bags : for loss in recovery % in Quintals

7000 x 180 x 0.93/10 = 117180

Value in crores @ Sugar price of Rs 33/kg: 117180 x 3300 /10000000 = 38.67 crores

Total Ethanol production in liters : 78372 x 310 = 24295320 (Refer coloumn D)

Ethanol produced in liters during off season :0

Total loss in Recovery = 9.02- 8.99 = (1.96-1.93) =0.03

Syrup + Final molasses diversion = 7000 x 180 x 0.03/10 = 3780

Value in crores : 3780 x 3300/10000000 = 1.247

Total Ethanol production : 45187 x 260 = 11748620

In case of Syrup : A x B = 24706 x 600 = 14823600 @ 35 Brix

In case of Syrup @ 45 Brix = 31765 x 600 = 19059000

In case of Syrup @ 60 Brix = 42353 x 600 = 25411800

Syrup + FM diversion : 7000 x 180 x (2.52-1.93 = 0.59)/10 = 74340 Quintals

74340 x 3300/10000000 = 24.53 crores

Total Ethanol production: 45187 x 260 = 11748620

Syrup + FM diversion : 7000 x (9.02 -7.59 = 1.43) x 180 /10= 180180.0

180180.00 x 3300/100000000 =59.46 crores

Total Ethanol production :45187 x 260 = 11748620

Revenue due to Sugar produced in case of BH 7000 x 180 x (C= 8.09) x (3300 /10000000)10=336 Crores

Revenue due to sugar production in case of Syrup diversion (7000-2000) x 180 (C= 8.99) x (3300/10000000) x 10 = 267 crores

Revenue due to Ethanol production during season D x rate/10000000

24295320 x (59.08 rate of Ethanol produced from BH) =143.54 Crores Net revenue

Gain in crores = 143.54 – 38.67 = 104.87 crores

Syrup + FM Diversion: @ syrup Syrup 35 Brix Revenue due to Ethanol produced : D x rate /10000000 =

14823600 x 63.45 (rate of Ethanol produced from Syrup)/10000000 = 94.06 Crores.

(E=11748620) x 46.66 (rate of Ethanol produced from CH)/10000000 = 54.82 crores Crores

94.06 +54.82 = 148.88 crores (Net Revenue).

Gross revenue : 148.88 – 1.247 = 147.63 crores

@ Syrup 45 Brix :Revenue due Ethanol produced during season D x rate : 19059000 x (63.45 rate of Ethanol produced from Syrup) = 120.93 crores

Net revenue : 120.93 + 54.82 = 175.75 crores

Gross revenue 175.75 – 24.53 = 151.22 crores.

@ Syrup 60 Brix: Revenue due to Ethanol produced during season D x rate : 25411800 x (63.45 rate of Ethanol produced from Syrup) = 161.24 crores

Net revenue : 161.24 + 54.82 = 216.06 crores .

Gross revenue : 216.06 – 59.46 =156.60 crores

Overall view diversion of partial syrup is advantageous by 156.60 (60 Brix) – 104.87 (BH) =45.21 crores (about 30 % more value)

Conclusion : Two cases are chosen for converting to Ethanol.First one diverting entire BH to ethanol production .Resulting in two massecuite massecute boiling.In the second case syrup production of 20 T/hr is diverted to Ethanol production. The remaining syrup is diverted to normal three massecuite boiling. In all the cases Raw sugar production with back end refinery is followed. In case of Sugar produced & alcohol produced (both in the season & off season). Partial syrup route is benefitial. About 30 % more product value than other route of BH diversion .

This paper is limited to diversion characteristics ,hence process chemical costs & packing material is not considered. This project is in implementation stage & will be coming out all the details needed after completion of project,next year. Similarly FRP recovery is calculated on the basis of Final molasses purity of 36.40, as per govt agencies (NSI,VSI & Federation of cooperative sugar factories etc). We are going as per factory data ,as of now.

Further I am also humbly indicating that ,some times the figures given in case of recovery ,may slightly defer with actual calculation ,as factories will adjust the figures ,in case needed. Also minor problems due to decimal point correction.

Soild balances in above cases are very complicated & as it is investigative in character is not considered.

Enclosures : Annexure Ia .Ethanol economics :Recovery calculations in case of BH diversion, in case of partial syrup diversion & of normal route without diversion. Please go through the tabulation coolly.

Acknowledgement :

The author is grateful to the Director Shri Narendra Mohan Agarwal, for giving necessary encouragement and permission to publish this article. Authour also put in record the timely information given by my DSTA colleagues Professor B.B.Gunjal,

Mr.V.M.Kulkarni & Professor K.Jagdush. Special thanks to Mr.C.Ramamohan Production Manager of Sadguru Sri Sri Sugar factory near Phandarpur (who was my student @ V.S.I), has helped in making the Recovery calculations & Assessment computer evaluation..

References :

1) Annexure I : H.S.A calculation in both the cases

2) Please refer Annexure Ia Ethanol Economics (attached separately)

3) Discussion with various colleagues in Industry & various seminar proceedings

Annexure I : H.S.A Distribution calculation :a) in case of BH diversion :

Pressure & Temp.across each body in case of Quintuple

Exh.at 00 kgs/cm^2.abs (120 deg C) & Last body @ 0.2 kg/cm^2.abs (60 deg C)

Details	**Exh**	**1st**	**2nd**	**3rd**	**4th**	**5th**
Kg/cm2/abs	2.00	1.604	1.226	0.866	0.524	0.20
Temp.Deg C	120	113.5	105	95.50	82.50	60

Evaporation in kgs/hr in Quintuple :

I 106350 ,II 88839 ,III 54963 , IV 12189 ,V 1414 kgs/hr

Calculation of leaving Brix & avg. Brix :

329 454x 13.56 = 4467396 =x

Sr.No	**Details**	**Leaving Brix**	**Avg.Brix**
I)	x/329454 – 106350	20.02	16.79
II)	x/223104-88839	33.27	26.65
III)	x/ 134265 -54963	56.40	44.83
IV)	x/ 79202- 12189	66.56	61.48
V)	x/67113 – 1414	68	67.28
	65699		

Calculation of Sp. Evaporation coefficient :

I) 0.001 (100- 20.02) (120-60) = 4.8
II) 0.001 (100-33.27) (113.5-60) = 3.57
III) 0.001 (100- 56.40) (105-60) = 1.962
IV) 0.0009(100- 66.56) (95.5– 60) = 1.0684
V) 0.0009 (100-68) (82.5-60) = 0.648

Calculation of B.P.E & ΔT :

Heating medium	Ts (Sat.temp.)	BPE Deg C	Te Deg C	ΔT(Deg .C)
Exhaust.	120			
1st Vapour FFE	113.5	0.35	113.85	6.15
2nd vapour FFE	105	0.55	105.55	7.95
3rd vapour FFE	95.5	0.825	96.325	8.675
4th vapour R	82.5	3.45	85.95	9.55
5th vapour R	60	7.36	67.36	15.14

a) Heating surface area calculation (m^2):

Sr.No	Evaporation quantity / ΔT x Sp.Evaporation coefficient	Area estimated in m^2	Area recommended in m^2	Remarks
I)	106350/6.15 x 4.8 FFE	3603	3600	Use one floating body FFE of 3600 for I/II/III
II)	88839/ 7.95 x 3.57 FFE	3130	3600	-
III)	54963/ 8.675 x1.962 FFE	3230	3600	-
IV)	12189/9.55 x 1.0684 R	1195	1400	(more area because of flash vapours) One stand by of 1400
V)	1414/ 15.14 x 0.648 R	144	400	(more area because of flash vapours) One std.by 400 m^2

HAS/TCD = 12600 /7000 = 1.80 M^2/TCD or 12600/319 = 39.5 M^2/TCH

Evaporation rates : 29.54/ 24.67/ 15.27/8.71 / 3.53 kgs/m^2/hr

b) H.S.A Distribution calculation : In case of partial diversion of Syrup

Pr & Temp. across each body in case of Quintuple

Exh.at 2.00 kgs/cm^2. abs (120 deg C) & Last body @ 0.2 kg/cm^2. abs (60 deg C)

Exh. pr.	1st	2nd	3rd	4th	5th
Kgs/cm^2/abs	1.604	1.226	0.866	0.524	0.20
Temp. deg.C	113.5	105	95.5	82.5	60

Evaporation quantities

Calculation of leaving Brix & avg. Brix :

329 454x 13.56 = 4467396 =x

Sr.No	Details	Leaving Brix	Avg.Brix
I)	x/ 329454- 98989	19.38	16.47
II)	x/230465- 82661	32.23	25.81
III)	x/147804- 54309	44.78	38.51
IV)	x/ 93495- 19287	60.20b)	52.59
V)	x/ 74208 – 8512	68.00	64.10
	x/ 65696		

Calculation of Sp. Evaporation coefficient :

I) 0.001 (100- 19.38) (120-60) = 4.837
II) 0.001 (100-32.23) (113.5-60) = 3.626
III) 0.001 (100- 44.78) (105-60) = 2.485
IV) 0.0009(100- 60.2) (95.5– 60) = 1.2844
V) 0.0009 (100-68) (82.5-60) = 0.648

Heating medium	Ts (Sat .Temp)	BPE Deg C	Te Deg C	ΔT (Deg C)
Exhaust	120	-	-	-
1st Vapour FFE	113.5	0.35	113.85	6.15
2nd Vapour FFE	105	0.55	105.55	7.95
3rd FFE	95.5	1.09	96.59	8.41
4th R	82.5	2.88.	85.38	10.12
5th R	60	7.30	67.30	15.20

Calculation of B.P.E/ΔT

Heating surface area calculation (m^2) :

Sr.No.	Evaporation quantity /ΔT x Sp.Evaporation coefficient	Area estimated in m^2	Areas recommended m^2	Remarks
I)	98989/ 6.15 X 4.837 FFE	3327	3500	Use one floating body of 3500 m^2 FFE as floating for I/II/III

II)	82661/ 7.95 X 3.626 FFE	2867	3500	-
III)	54309/ 8.41 X 2.485 FFE	2599	3500	-
IV)	19287/ 10.12 x 1.2844 R	1484	1600	More area because of flash vapours. Add one 1600 as std by
V)	8512 / 15.2 X 0.648 R	864	1000	More area because of flash vapours. Use another 1000 m^2 R as stand by.

H.S.A/TCD = 13100/7000 =1.87 M^2/T.C.D i.e 13100/ 319 = 41.06 M^2/T.C.H

Evaporation rates : I -28.28/II-23.62/ III- 15.52/R- 12.05/R- 8.5 kgs/cm2-hr

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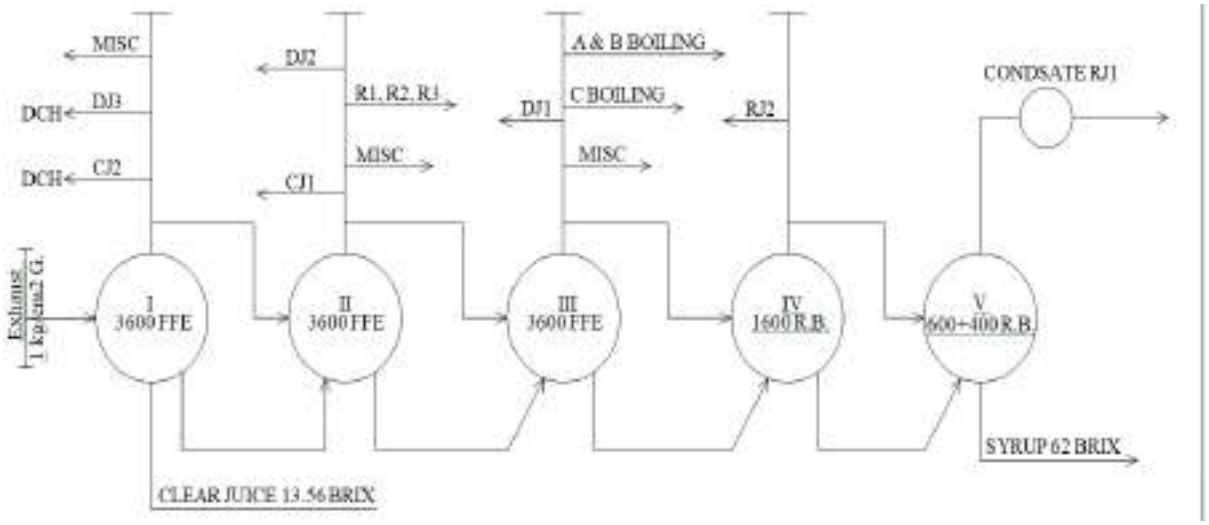
Annexure-I

EVAPORATOR CONFIGURATION FOR BH/ PARTIAL SYRUP



FLOATING FOR 1st & 2nd & 3rd 3600 FFE, 4th 1600 R.B, 5th 600 R.B. Mtr. Sq. (HEATER)

Annexure-Ia

REVISED ETHANOL ECONOMICS :

Crushing Capacity			7000 tons/day						Estimated crushing	1260000 Tons		Tons
Crushing Equivalent to Syrup diverted			2000 Tons/day						Gross Season Days	180		
S NO	Description	Duration of diversion Days	Qty MT/Hr	% on total cane crushed	Brix	ppy	Estimated loss % with 2000 tons cane	Estimated loss % with 7000 tons crush cane	Estimated overall recovery Based on last season figures (Recovery Differential) Total loss in syrup - loss in FM(I)	Sugar Qty in Syrup (A)	Syrup/Molasses Qty. -Cane x syrup or molasses % cane x Days of Diversion of syrup or molasses (A1)	Estimated yield Litre@ per ton (B)
1	Syrup Diversion	180	20.00	6.86	35.00	81.70	6.86	1.96		24706		600
			20.00	6.86	45.00	81.70	8.82	2.52		31765		
			20.00	6.86	60.00	81.70	11.76	3.36		42353		
2	BH Diversion	180	18.14	6.22	88	52.33		2.86	8.09		78372	310
3	FM Diversion	180	10.46	5.01	90	42.81		1.93	8.99		45387	260
									0.43			
									7.59			
4	FM prod. Without syrup diversion	180	14.64	5.02	90	42.81		1.93	9.02			

	Description	Estimated overall recovery Based on last season Figures @	Total loss in Pan% (Differential loss+loss with BH diversion loss with FM) (1)	Equivalent sugar loss for loss in Pan% Qty. 7000X180X (1/10 2)	Value in Crs (2) x 3500/10000000 (3)	Total Ethanol production in Ltrs (A1 x B) in case of syrup and (A1 x B) in case of BH, FM (4)	Ethanol production in ltrs during off-season (A1 x B) (5)	Revenue due to sugar produced 7000X180 x Qty. 3500/10000000 x Rs and (7000-2000) x Qty. 3500/10000000 x Rs in case of Syrup	Revenue due to Ethanol production during season in Crs (5*X rate/ 10000000 (6)	Revenue due to Ethanol prod. In off season in Crs. (5 X rate / 10000000 (6)	Net Revenue in Crs (4+6) (8)	Gain in Crs (8-A3)
1	Only BH Diversion	8.09	0.93	117180.00	38.67	24299310	0	836	143.54	0.00	143.54	104.87
2	Syrup diversion and FM production with three evaporative boiling	8.99	0.050	3780	1.25	1483800	13749020	357	94.06	54.02	148.08	147.63
		8.43	0.590	74340	24.53	18089020			133.89		175.75	151.11
		7.59	1.430	180180	59.46	25411800			159.21		206.06	156.60

Note : Gain assessed only on Ethanol Production and Recovery loss in two cases.

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ABSTRACTS

Population Structure of Coimbatore Canes Developed in a Century of Sugarcane Breeding in India by K.Mohanraj & Ram Bakshi published in Sugar Tech Journal-2022.

One hundred years have passed since the inception of sugarcane breeding in India and the country witnessed 9.58-fold increase in sugarcane production. A major factor for this success was due to the impact of Coimbatore canes (Co canes) developed at ICAR-Sugarcane Breeding Institute, Coimbatore, India, which dominate the sugarcane area in the country. This study was conducted to gain knowledge about population structure of the improved genetic material comprising 1453 Co canes for their judicious utilization in sugarcane improvement activities. The strength and weakness of each sub-population for important yield and juice quality traits revealed from the study are summarized.

Coconut Sugar- a Potential Storehouse of Nutritive Metabolites, Novel Bio-products and Prospects by A.C. Mathew published in Sugar Tech Journal-2022.

Coconut sugar is prepared by concentration of inflorescence sap, popularly called as neera or Kalparasa®, collected by tapping the unopened coconut spadix. The sap in its original form contains 14–16% sucrose which upon heating at 90–95 °C turns into long threads followed by agitation or beating to form a crystalline or amorphous sugar. The coconut sugar is brown in color and contains 2–3% moisture. Unlike the commercially available sugars which are laden with high calories, palm-based sugars are rich in amino acids, vitamins, minerals, polyphenols and antioxidants. Moreover, the glycemic index (GI) of the sugar is relatively low making it a suitable healthy sweetener for all the age groups.

World ethanol producers' rankings in major reshuffle by FO Licht GmbH published in International Sugar Journal in October, 2021.

USA continues to be the largest producer of ethanol globally followed by Brazil. The Covid-19 pandemic impacted the sector adversely as the rise in unemployment, plus the attendant restrictions on movement resulted in people driving much less than before and thereby decreasing demand for transportation fuel. US companies Poet, Valero and ADM will continue to dominate the league table of top producers. The Brazilian company Raizen is expected to move up in rankings (to 4) in 2021/22 following the recent acquisition of the sugar-ethanol producer Biosev.

Predicting sugarcane physiological traits using hyperspectral reflectance by S Natarajan, J Deutschenbaur, J Basnayake & P Lakshmanan published in International Sugar Journal in October, 2021.

Physiological traits have the potential to accelerate genetic improvement for adaptation to abiotic stresses, resource-

use efficiency, and yield. However, using these traits as selection targets in breeding programs is constrained by current phenotyping approaches that involve destructive, time-consuming, and labor-intensive measurements. There is growing interest in developing high-throughput tools and prediction models for the precise phenotyping of important physiological traits under field conditions. The aim of this study was to explore the potential of remotely piloted aircraft (RPA)-based canopy hyperspectral reflectance for predicting physiological and biochemical traits in sugarcane.

Use of graphic methodologies to analyze yearly factory data for improved identification of problems and solutions by S. Imbachi-Ordonez, F. Aponte & B. Montes published in International Sugar Journal in October, 2021.

Most of the information generated daily in sugarcane factories is not adequately analyzed, because factories do not have the resources to do it or the time. Few factories analyze the information, and the analysis normally performed includes means and simple line graphs. Graphic methodologies such as box plots or histograms allow a more accurate analysis of the data and offer more practical information from which the staff can draw conclusions quickly. In this study, daily data from one Louisiana (LA) factory across four processing seasons (2015-2019) were analyzed.

Nitrite as an indicator of activity of thermophilic microorganisms by Ilona Błaszczyk published in International Sugar Journal in October, 2021.

The aim of the study was to evaluate the usefulness of nitrite measurement as an indicator to determine the level of thermophilic bacteria. The activity of thermophilic bacteria is particularly burdensome during the process of saccharose extraction from sugar beets. Therefore, the laboratory tests discussed in the paper refer to this stage of the technological process. In this paper, attention was paid to a number of factors determining good reflection of thermophilic bacteria activity by changing the nitrite content, i.e. the beet growing region, the temperature of the process beet, and the access to oxygen.

Organic beet sugar production grows faster than cane rival by FO Licht GmbH published in International Sugar Journal in November, 2021.

Organic sugar remains a small part of world sugar consumption and international trade (0.3% and 1%, respectively). The growth of the world organic sugar market has been impressive: from 20,000-40,000 tonnes in 1999 to more than 300,000 in 2009 and close to 590,000 in 2021. Top organic sugar producers currently are Brazil, Paraguay and Colombia. While the trend for organic sugar produced from cane is flattening, over the last few years, organic beet sugar production in the EU seems the more dynamic segment, probably due to the sugar

producers having to contend with volatility in prices in the global.

Using carbonation lime sludge in the co-composting of wastewater sludge and green waste: Physicochemical and microbial monitoring by S. Rida, O. Saadani Hassani, N. Saadaoui, M. Mobaligh, N. Souraa, S. Loqman & K. Fares published in International Sugar Journal in November, 2021.

The development of human activities, the acceleration of economic growth, and the extensive construction of wastewater treatment plants in Morocco, has led to a considerable increase in the amount of sludge. This sludge is piled next to the factories, either stored on-site or mixed with household waste in landfills without any treatment. Furthermore, the sugar industry in Morocco annually produces about 270000 tons of carbonation lime sludge. The objective of this study was to evaluate how much we can improve the co-composting of wastewater sludge and green waste using carbonation lime sludge.

Enhancement of mill performance by adopting low-speed milling in the sugar industry by RA Chandgude & PG Patil published in International Sugar Journal in November, 2021.

There is considerable debate on selecting the proper milling speed for optimum performance in capacity and extraction. Low-speed milling is the most appropriate option to achieve optimum performance of a milling tandem. Mills conventionally operate at a surface speed of 12 m/min to 26 m/min. However, the circumferential speed for mill tandems in Indian sugar mills varies between 8 m/min and 18 m/min. Power consumed by each mill in the tandem is proportional to the speed of the respective mill, as torque is almost constant. A comparative study of conventional high-speed (mill surface speed above 12 m/min) and low-speed.

Russian roulette: Sugar version by Sergey Gudoshnikov published in International Sugar Journal in November, 2021.

At the beginning of the 21st century, Russia was the leading sugar importer – importing around 4 million to 5 million tonnes sugar to satisfy local demand of around 6 million tonnes as domestic production was only 2 million tonnes. In 2007, the government sketched out a national sugar policy to expand sugar production to cover at least 80% of domestic consumption. The price tag for the expansion was US$2 billion and the government chipped in with US$560 million. Domestic sugar production continued to expand from 2011, peaking to over 7 million tonnes in 2018.

Beneficial microbes for sustainable sugarcane cultivation by R. Gopi, B. Mahendran, M. Nisha & P. Mahesh published in International Sugar Journal in December, 2021.

Insect pests, diseases, weeds, and various abiotic stresses, such as drought, salinity, and waterlogging, are the major constraints for sugarcane cultivation. In recent years, eco-friendly cultivation approaches have gained

importance worldwide. Several eco-friendly approaches are available for plant protection, weed and nutrient management, and management of abiotic stresses induced by climate change and other factors. The use of beneficial microbes is an important approach widely recommended for growing crops and is considered sustainable, readily available, and eco-friendly. Bacterial and fungal agents such as plant growth-promoting rhizobacteria (PGPRs), biological nitrogen-fixing microorganisms, phosphate-solubilizing bacteria, entomopathogens, and bio-control agents have been identified.

Identification of resistance to red rot in interspecific and intergeneric hybrid clones of sugarcane by R. Viswanathan, R. Selvakumar, P. Govindaraj, M.L. Chhabra, B. Parameswari, Dinesh Singh, Sujeet Pratap Singh, Rakesh Mehra, Y. P. Bharti, Minnatullah, P. Kishore Varma, V. Ravichandran, Anuradha Sharma published in International Sugar Journal in December, 2021.

The incorporation of red rot resistance in sugarcane is the foremost priority in Indian sugarcane breeding programs. An ideal parent should possess a high sucrose content, good agronomic traits, and red rot resistance. To enrich the parental pool with resistant sources having diverse backgrounds, many interspecific hybrid (ISH) clones and intergeneric hybrid (IGH) clones were identified in the previous decades from the 1960s and were utilised in the National Hybridization Programme. To further augment red rot resistance in the parental clones, we selected 27 ISH clones developed at ICAR-SBI Coimbatore and evaluated them against the prevailing Colletotrichum falcatum pathotypes.

Impacts of superheated steam on juice degradation and evaporator performance by C Marasinghege, DW Rackemann & WOS Doherty published in International Sugar Journal in December, 2021.

Process steam used in juice evaporation is typically supplied from a turbine exhaust or from a pressure let-down station and so is usually superheated. Superheat raises the temperature difference between the heating surface and the temperature of the bulk juice in the first evaporator. There is anecdotal evidence that large amounts of superheat can reduce the heat-transfer coefficients of the first evaporator as the superheated vapour can blanket the heating surface, which impedes condensation, and this, in turn, raises the calandria pressures and increases the scaling rates of the evaporators.

Management of the technical skillset required to support automation in the sugar industry by Nina West_published in International Sugar Journal in December, 2021.

As in many industries, the Australian sugar industry has seen change driven by advances in automation technology. The many advantages delivered by these technologies and the

inevitable use across all industries are seemingly well researched and accepted. However, an element of the progression towards advanced automation technologies that appears to have been somewhat taken for granted is the management of the technical skillset required to support them. This paper aims to highlight the challenges that have been observed in practice on this topic.

Editor

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