Sugar Industry Technologists, Inc.

Seventy Eighth Annual Technical Meeting Durban, South Africa

Hilton Durban

2019 Daily Program

Sunday, May 5, 2019

9:00 am - 5:00 pm	Registration B Level
9:00 am -2:30 pm	Presenters Rehearsal Polo Room B Level
2:00 pm – 10:00 pm	Exhibitors Set Up B Level
3:30 pm -5:30 pm	S.I.T. Directors Meeting Mkhomazi 1&2 M Level
6:30 pm - 8:00 pm	S.I.T. Mixer Reception Outer Terrace M Level Sponsored by Sugar Technology International, Plano, Texas, U.S.A.

Monday, May 6, 2019

8:00 am - 5:00 pm	Registration – B Level
8:00 am – 10:00 pm	Exhibitors Presentation - B Level
8:00 am - 4:00 pm	Spousal/Guest Program - Departure from Hotel Lobby at 8:00 am

FIRST TECHNICAL SESSION

Ballroom 1 & 2, B Level

Paul Schorn
Tongaat Hulett Sugar South Africa Ltd.

8:30 am	Address of Welcome: Paul Schorn, President - Sugar Industry Technologists
8:40 am	#1199 - Keynote Speaker: Dr. Janice Dewar, CEO, Sugar Milling Research Institute.
9:00 am	#1200 - "A New Triple Effect Evaporator Station for Energy Efficient Fine Liquor Concentration at the Tongaat-Hulett Rossburgh Refinery", Love DJ, Rambakus Z, and Maharaj C, Tongaat Hulett Ltd.
9:30 am	#1201 – "Continuous Seed Preparation by Sound Induced Nucleation: The Journey from Benchtop to Pilot Seed Production", Rahiman SN, Madho S, Davis SB, Sugar Milling Research Institute, and Love DJ, Tongaat Hulett Ltd.
10:00 am	Coffee Service – Poster viewing. B Level
10:30 am	#1202– "High Dextran Raw Sugar – A Refiner's Nightmare", Moodley M, Khomo N, Tongaat-Hulett Sugar Refinery and Nel S., Sugar Milling Research Institute.
11:00 am	#1203 – "Online Monitoring of Batch Cooling Crystallisation", L. Rózsa, J. Rózsa ZUTORA Ltd., Hungary, and Juha Paldanius, K-PATENTS Oy., Finland.
11:30 am	#1204 – "The Elimination of Clarification by Phosphatation at the La Union Refinery in Guatemala – Commercial Results", Jerry Lengen, Graver Technologies, U.S.A.
12:00 am	Annual General Meeting of the Corporation of Sugar Industry Technologists, Inc., Election of Board of Directors.
12:10 Noon	New Board of Directors Meeting
12:20 pm	Lunch, Vasco's Restaurant. R Level Sponsored by Jord International, Australia

SECOND TECHNICAL SESSION

Ballroom 1 & 2, B Level

Ahmed Vawda – Presiding
United Sugar Company.

2:00 pm — #1205 - "The Potential of Waste Water Reuse in the Sugar Refining Industry". M. Alraee, N. Tharwat and A. S. Vawda, United Sugar Company, Saudi Arabia.

2:30 pm — #1206 - "Back to Basics - Your Guide to Sugar Refining Excellence", Emmanuel M. Sarir, Carbo-Solutions International, U.S.A.

3:00 pm — #1207 – "Evaluating the Strength of Kokuto Taste in Sugar Products Using a Taste Recognition System and its Relationship with Components", Akio Hirata PhD, Research & Development Division, Mitsui Sugar Co., Ltd. Japan

3:30 pm — Coffee Service – Poster viewing. B Level

4:00 pm — #1208 - SYMPOSIUM A

"Improving Filter Performance"

Chairman and Moderator: Abdel Jalil Kaddoury, COSUMAR SA.

Panelists:

TBA

Tuesday, May 7, 2019

8:00 am - 5:00 pm	Registration – B Level
8:00 am – 10:00 pm	Exhibitors Presentation - B Level
8:00 am - 4:00 pm	Spousal/Guest Program - Departure from Hotel Lobby at 8:00 am

THIRD TECHNICAL SESSION

Ballroom 1 & 2, B Level

Michael Burchell – Presiding
ASR Group, C&H Sugar Company.

8:30 am	#1209 - "Evaluation of Recycling Options for Carbonatation Press Mud", Y. Abdelatif, N. Tharwat and A. S. Vawda, United Sugar Company, Saudi Arabia.
9:00 am	#1210 – "Filtration of Standard Liquor Without the Use of a Filteraid", BM Muir, C. Meade and V. Chaignon, Tereos Group, S. Schöpf*, Lenzing Technik GmbH.
9:30 am	#1211 – "How Accurate is your Lab Data", Colbert Edwards and S. Michael Burchell, ASR Group - Redpath Refinery, Toronto, Canada.
10:00 am	Coffee Service – Poster viewing. B Level
10:30 am	#1212– "Modifications to a Complicated Steam System to Stabilise Steam Pressures and Prevent Blow-Off at the Tongaat-Hulett Rossburgh Refinery", Jensen P.S., Love D. and Ramjuan N., Tongaat-Hulett Ltd.
11:00 am	#1213 - "Online Measurements of Sugar Crystallization Campaign with a Portable Non-Intrusive Instrument", Eloranta Hannu, Honkanen Markus and Myers Craig, Pixact Ltd., Finland.
11:30 am	#1214 – "12 Years of Sugarcane Antioxidant Development from bench to Commercialization—A Case Study", Minori Uchimiya, USDA-ARS Southern Regional Research Center, U.S.A., Syuntaro Hiradate, National Institute for Agro-Environmental Sciences, Japan, Chung Chi Chou, President, Dr Chou Technologies, Inc., U.S.A.
12:00 Noon	Lunch – On your Own

FOURTH TECHNICAL SESSION

Ballroom 1 & 2, B Level

	Jack Thompson – Presiding Louisiana Sugar Refining, LLC.
2:00 pm	#1215 - "A Technical Assessment of a New Continuous Ion Exchange Decolourisation Plant at the Tongaat-Hulett Rossburgh Refinery", Ndinisa V, Jensen C, Tongaat Hulett Sugar, Technology Group and Maharaj C, Tongaat Hulett Refinery
2:30 pm	#1216 - "Sustainability Driven Innovation in Sugar Processing", John Kerr, Tate & Lyle Sugars, ASR
3:00 pm	#1217 – "Split and Dual Continuous Pans - Design Aspects for Maximizing the Benefits to Sugar Mills", M. Pandu Ranga Rao, Shrijee Process Engineering Works Ltd, Mumbai, India
3:30 pm	Coffee Service – Poster viewing. B Level
3:50 pm	#1218 - SYMPOSIUM B "Best Practices to have in order to be cost efficient in energy savings" Chairman and Moderator: Abdeljalil Kaddoury, COSUMAR SA. Panelists: TBA
5:00 pm	Invitation to New Orleans, Jack Thompson, Louisiana Sugar Refining, LLC.
5:10 pm	President Closing Remarks
7:00 pm	Reception. B Level
8:00 pm	Banquet Ballroom 1&2. B Level
10:00 pm	Entertainment Ballroom 1&2. B Level

POSTERS: **B level**

#1219 – "The Return of Carbon Based Adsorbents for Refinery Decolourization", Emmanuel Sarir, Carbo-Solutions International.

Wednesday, May 8, 2019

8:00 am First Bus leaves for Refinery Tour

1:30 pm Lunch at the refinery

4:30 pm Buses return to either the Hilton Hotel Durban or to Anew Hotel Hluhluwe

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FUTURE MEETINGS

2020 **May 3-6, New Orleans, LA, U.S.A.**

2021 **April 4-7, 2021, Dubai, U.A.E.**

2022 **TBD, 2022, Vancouver, CANADA**

2023 **TBD, 2023, Casablanca, MOROCCO**

ABSTRACTS

KEYNOTE SPEAKER PRESENTATION

#1199

David Meadows, Director Strategic Development and Business Excellence, Tongaat Hulett Sugar.

A NEW TRIPLE EFFECT EVAPORATOR STATION FOR ENERGY EFFICIENT FINE LIQUOR CONCENTRATION AT THE TONGAAT-HULETT ROSSBURGH REFINERY

#1200

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As part of a longer-term plan to refurbish and upgrade the performance of the Tongaat Hulett Refinery in Rossburgh, Durban, a new evaporator station has recently been installed and commissioned. The evaporator is required to concentrate liquor from the ion-exchange decolourisation plant to generate a fine liquor feed for the first stage of pan boiling. To provide a high level of energy efficiency, the evaporator station is a triple effect unit with vapour three used for heating main melt in a direct contact heater (vapour melter). Fitting a triple effect between the exhaust steam range pressure and the required vapour three pressure provides a relatively small temperature differential across each effect. Falling effect evaporator vessels, of an in-house design, have been used to provide effective evaporation with the limited temperature differentials.

The paper describes the design of the evaporator station and gives details of the performance achieved during the first year of operation.

CONTINUOUS SEED PREPARATION BY SOUND INDUCED NUCLEATION: THE JOURNEY FROM BENCHTOP TO PILOT SEED PRODUCTION

#1201

Rahiman SN[1], Madho S[2], Davis SB[3] and Love DJ[4]
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[4]Tongaat Hulett Technology Group, *PO Box 3, Tongaat, 4400, South Africa*

The quest to develop a continuous crystal seed preparation process for sugar production has long been a goal for sugar technologists and researchers. The Sugar Milling Research Institute NPC, in collaboration with Tongaat Hulett Technology Group, has successfully produced seed crystals of desired quality at a bench-top scale by means of continuous insonation of supersaturated pure sucrose solutions. The bench-top work culminated in the design and construction of a pilot plant capable of producing 300 litres of seed sufficient to seed a 42 m^3 batch white pan.

The pilot plant work demonstrated that the core technology in the seed preparation system had successfully replicated the results obtained in the benchtop study under similar test conditions. Regular-shaped seed crystals with a median size of 50 µm (±5% variation), size coefficient of variation of 42% (±7% variation) and crystal production rate of 6 x 10^8 crystals/min (±7% variation) were produced by allowing nuclei to exhaust the surrounding mother liquor at constant temperature conditions. Some technical challenges that were experienced during the commissioning of the pilot system are discussed in the paper.

It is planned to conduct refinery pan boiling trials seeded with the pilot plant batches of seed to determine what improvement in white massecuite technology can be achieved relative to conventional seeding. If successful, a full-scale prototype will be developed for installation and testing in a factory. The continuous seed technology has the potential to provide a viable means of achieving reliable "full seeding" in both raw sugar factories and sugar refineries.

HIGH DEXTRAN RAW SUGAR – A REFINER'S NIGHTMARE

#1202

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Historically, the raw sugar that was processed by the Tongaat-Hulett Sugar Refinery (Hulref) had low levels of dextran (<100 ppm). However, in the past five years the levels of dextran in the raw sugar have been increasing. As high levels of dextran have a deleterious effect on some of the unit operations in a refinery, investigative work was initiated in the following areas:

- Understanding the reasons for the increase in dextran in raw sugar
- Effects of high dextran on refinery operations
- Dextran balance in the refinery
- Evaluating the efficacy of blending of the raw sugars as a way of reducing the high dextran concentrations entering the refinery
- Laboratory evaluation of dextranase enzymes to reduce the levels of dextran in raw sugar

The paper reports on the results obtained from these investigations.
Keywords: dextran, viscosity, dextranase, refined sugar quality

ONLINE MONITORING OF BATCH COOLING CRYSTALLISATION

#1203

L. Rózsa ZUTORA Ltd., Hungary, J. Rózsa ZUTORA Ltd., Hungary, Juha Paldanius, K-PATENTS Oy., Finland

Batch cooling crystallisation is a widely practiced production process in several industries. In the sugar industry it is mainly used as the first step to produce massecuite (footing magma) to seed batch or continuous evaporating crystallisers and to increase the final exhaustion of sugar from the basic raw material (beet or cane). In the pharmaceutical industry it is used to produce the final product directly. Cooling crystallisation is carried out in different types of equipment, the typical ones having

cooling coils or jacketed vessels with built-in stirrers.

During batch evaporative crystallisation, widely used in the sugar industry advanced instruments (process refractometer, microwave and SeedMaster device etc.) are able to provide quite many online data (in-cluding supersaturation) on the most important parameters of the massecuite. Contrary to this practice, instrumentation in cooling crystallisers used in the sugar industry is rather poor: monitoring and control of the process mostly relies only on the measurement of temperature.

This paper reports on a series of tests carried out in a sugar mill in Central Europe to monitor online the most important parameters (supersaturation, crystal content and mean crystal size, product (crystal) yield, mother liquor purity etc.) by using a built-in process refractometer and a SeedMaster 3 (SM-3) device communicating with the plant DCS.

The test results clearly testify: the present control practice relying on a pre-set temperature profile (control of the process will be the subject of a further communication) could and should be considerably improved by using supersaturation, the most important parameter of crystallisation for control. It would also help to maintain consistent final product crystal content. In addition, data on the other parameters, for example: mean crystal size (MA) can also be used to improve local seeding practice.

ELIMINATON OF THE PHOSPHATATION PROCESS AT LA UNION CANE SUGAR REFINERY (GUATEMALA) – COMMERCIAL RESULTS

#1204

Jerry Lengen - Business Development Manager, Sugar Segment; Graver Technologies, Idalberto Delgado - Sugar Applications Engineering Manager; Graver Technologies, Francisco Gonzalez – Sugar Applications Engineer; Graver Technologies, Mario Canales - Sugar Applications Engineer; Graver Technologies, Maynor Cupertino Mejia – Refinery Manager; Ingenio La Union, Juan Pedro Quiñónez – Refinery Process Engineer; Ingenio La Union

Refining sugar requires the removal of color, turbidity, ash and other impurities from the raw sugar. To do so, the "La Unión" refinery in Guatemala utilizes clarification process (phosphatation) followed by a decolorization process (using the multifunctional adsorbent Ecosorb S-501) to deliver a fine liquor to the crystallization step. Phosphatation consumes chemicals and involves two clarification processes, one of them to recover the clarified

liquor and another one for scum de-sweetening to minimize sugar losses. During a brief trial near the end of the 2017/2018 crop season, the phosphatation-clarification processes were replaced by a single purification process, using the improved multifunctional adsorbent Ecosorb® S-501. The results were promising, producing refined sugar of the same quality as before (despite unusually poor harvest conditions during the trial period), with an increase in sugar recovery in the refinery and an overall reduction in the cost of the operation > 10%. Based on these initial results, La Union and Graver agreed to run a longer, full scale commercial trial to optimize the process, and to verify and quantify the improvements in yield and over-all cost per ton of sugar produced. In addition, with the elimination of the clarifier, it was decided to increase the brix of the raw melt from 64 to 67, resulting in a significant decrease in steam usage (and higher sales of electricity back to the grid) and an increase in refined sugar capacity. Results verified initial conclusions, and La Union has adopted this new process on an on-going basis.
Keywords: *Ecosorb, adsorbents, decolorization, clarification*

THE POTENTIAL OF WASTE WATER REUSE IN THE SUGAR REFINING INDUSTRY

#1205

M. Alraee, N. Tharwat and A. S. Vawda, United Sugar Company, Saudi Arabia, mraee@savola.com

United Sugar Company operates a port based destination refinery with no access to fresh water. Consequently, it operates three thermal desalination plants. The cost of water has been escalating as the country liberalises the energy sector exposing industry to higher fuel prices. Over the years, the refinery has implemented several small modifications to reduce the water consumption from 500 lit/ton sugar to 380 lit/ton sugar. The paper discusses some of the small practical ideas and shares some details on one novel idea employing reverse osmosis for recovering wastewater.

Wastewater reuse potential depends on waste volume, concentration and characteristics, operation and maintenance costs, availability of fresh water and regulatory standards. Stringent recycling and reuse is a good option for sugar refiners whose fresh water costs are high and are operating in increasingly competitive market with stringent regulatory environment. The company embarked on a ZERO effluent goal several years ago and is well on its way to achieve this. This paper discusses the steps taken to reduce effluent and its concentration, and the use of secondary and tertiary treatment to achieve the goal

of zero effluent.

Key words: Activated sludge, cooling tower, multi effect desalination, reverse osmosis, chemical oxygen demand

BACK TO BASICS - YOUR GUIDE TO SUGAR REFINING EXCELLENCE

#1206

Emmanuel M. Sarir, Carbo-Solutions International, sarire@carbo-solutions.com

Most sugar refiners understand the type of impact continuous improvement initiatives can have on bottom lines. However, attaining that business value is a journey, not a destination. Good manufacturing practice are steps taken to ensure maximum profitability and minimum losses.

Today refiners are spending more time and attention to improve their conversion costs. This means energy, maintenance and chemical usage are constantly being measured and improved.

This report discusses the basics of sugar refining which when followed delivers good performance and profitability. It focuses on:

1. Yield and sugar loss
2. Energy costs
3. Chemical costs
4. Continuous improvement
5. Benchmarking

Keywords: Molasses purity, recycle, hygiene, water saving, steam saving, root cause analysis.

EVALUATING THE STRENGTH OF *KOKUTO* TASTE IN SUGAR PRODUCTS USING A TASTE RECOGNITION SYSTEM AND ITS RELATIONSHIP WITH COMPONENTS

#1207

Akio Hirata PhD, Executive Officer, Research & Development Division, Mitsui Sugar Co., Ltd., 36-2 Nihonbashi-Hakozakicho, Chuo-ku, Tokyo, 103-8423, Japan

The strength of taste of sugarcane-derived sugar products was evaluated using a taste recognition system and its relationship with sensory testing and components respectively were confirmed. It was confirmed that the

taste evaluation values by a taste recognition system are lower in refined sugar and higher in brown sugar and *kokuto* (non-centrifugal cane sugar), respectively and are dependent on the concentration of *kokuto*, which suggests that a taste recognition system can be used to evaluate

differences of sugarcane-derived sugar products. Then, PCI scores obtained by principal component analysis of these evaluation values showed a high positive correlation (r = 0.981) with the strength of *kokuto* taste by sensory testing. These results suggest that the strength of *kokuto* taste in sensory testing can be evaluated by a taste recognition system and its results can be used as a "*kokuto* taste index." PCI scores and the strength of *kokuto* taste in sensory testing showed high positive correlations with ionic content, anionic content and polyphenol content and a high negative correlation with sugar content. PCI scores of *kokuto* of Okinawa and Kagoshima, which were obtained by performing an evaluation using a taste evaluation system, corresponded with the above-mentioned *kokuto* taste index at a correlation coefficient of r = 1.000. These results suggest that a *kokuto* taste index can be used as an indicator of measuring the strength of taste of *kokuto* derived from sugarcane and that a taste recognition system can be used for developing *kokuto* products.

SYMPOSIUM A

IMPROVING FILTER PERFORMANCE

#1208

EVALUATION OF RECYCLING OPTIONS FOR CARBONATATION PRESS MUD

#1209

Y. Abdelatif, N. Tharwat and A. S. Vawda, United Sugar Company, Saudi Arabia, abdelatif@savola.com

United Sugar Company operates a port based destination refinery employing carbonatation as its main melt clarification process. This process is well known to produce large amounts of press mud, also known as precipitated calcium carbonate PCC, and is increasingly viewed as an environmentally unfriendly process. The mud is typically disposed as solid waste at a municipal land fill site. This off course presents a significant economic burden to daily operations. The goal was to find useful and economical alternatives for the disposal of press mud. This study investigates a sustainable development strategy from beneficial utilization of this material. There are several options where the material, essentially calcium carbonate,

may be used. In this study, the following areas were explored and practical and sustainable uses were considered.

1. Cement
2. Paper
3. Pollution control
4. Agriculture
5. Other uses

Key words: Carbonatation, calcium carbonate, solid waste disposal, precipitated calcium carbonate

FILTRATION OF STANDARD LIQUOR WITHOUT THE USE OF A FILTERAID

#1210

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Extraction of sugar from sugarbeet for sugar production on an industrial scale can be divided into two distinct types of operations: beet processing (operation of the entire factory) and syrup processing (operation of the sugar refinery only). During beet campaign evaporator syrup is stored in large tanks for subsequent processing in the syrup campaign.

It is good practice to filter the evaporator syrup prior to storage for removal of microbes and insolubles. More importantly is filtration of the syrup during the syrup campaign for food safety and to remove any solids that has precipitated during storage for sugar quality. This is normally done using a filteraid to ensure filtration down to 8 µm is achieved.

Filteraid is not ideal due to health concerns and the risk of causing sugar quality issues if filteraid is carried forward with the syrup. A filtration system designed to operate without the use of a filteraid was therefore trialled at one of the Tereos factories in France. Standard liquor from storage tanks were filtered through 20 µm, 14 µm and 10 µm filter material during the 2018 syrup campaign. Operational and sugar quality results are discussed.

HOW ACCURATE IS YOUR LAB DATA

#1211

Colbert Edwards & S. Michael Burchell, ASR Group - Redpath Refinery, Toronto, Canada

Without accurate and reproducible laboratory data, process

decisions are difficult to make and may in fact be made incorrectly. In 2018, the Redpath refinery in Toronto, Canada undertook a continuous improvement (CI) project to reduce chemical sucrose losses in the remelt / recovery streams as there was believed to be significant financial opportunity via the reduction in sucrose loss in this process operation. The standard method of chemical sucrose loss within ASR Group refineries is a comparison of Invert/Chloride ratios between input and output syrups from a process step – Chloride is expected to remain unchanged by the refining process (outside of ion exchange decolorization processes). While collecting baseline data and analyzing opportunities for improvement, we discovered that the measurement system for invert determination (by Lane-Eynon method) of samples were too variable: Total Gage R&R variance

components (%Contribution) being > 9% for the invert analysis of Affination Syrup (56.37%), Jet 4 (92.04%), and Process Molasses (23.6%). This changed the focus of the CI project from sucrose loss reduction to laboratory data accuracy. Inconsistencies were identified in both individual analyst repeatability as well as reproducibility between analysts testing the same samples. Using statistical tools and comparing various methods of invert measurement, a change to the invert testing procedure was instituted and has proven to have a much lower Total Gage R&R variance (4.02 - 5.77%) for 2 of the same 3 sample types.

MODIFICATIONS TO A COMPLICATED STEAM SYSTEM TO STABILISE STEAM PRESSURES AND PREVENT BLOW-OFF AT THE TONGAAT-HULETT ROSSBURGH REFINERY.

#1212

Jensen PS[1], Love D[2], Ramjuan N[3]
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The Tongaat Hulett Refinery at Rossburgh in Durban is a

stand-alone refinery that was built in 1910 and has been modified extensively since. The result of incremental changes over the years is a complex refinery that incorporates both new and old plant and equipment.

Recent efforts to improve performance and steam economy, in particular the full automation of refined sugar batch pans, highlighted the limitations of the existing steam system to provide stable steam pressures whilst also avoiding costly and environmentally unfriendly steam blow-off. A critical aspect of the steam system is its ability to supply the varying process steam load, from batch pan operation, without placing an unacceptably variable steam generation load on the boilers. The large thermal inertia of the stoker fired boilers makes changing the steam supply, in response to intermittent changes in steam demand, impractical. Part of the current steam system is a steam accumulator originally installed in 1935 to address exactly this problem, but within a much simpler steam system at a substantially lower production rate. Whilst the accumulator was highly effective when originally installed it was providing minimal benefit within the existing steam system.

This paper describes the modifications recently made to the steam system to stabilise steam pressures and avoid steam blow-off to atmosphere. To minimise capital cost, the modifications were designed to make the most effective use of existing equipment, including the 1935 accumulator, and to use minimal new equipment.

ONLINE MEASUREMENTS OF SUGAR CRYSTALLIZATION CAMPAIGN WITH A PORTABLE NON-INTRUSIVE INSTRUMENT

#1213

Eloranta Hannu, Honkanen Markus and Myers Craig, Pixact Ltd, Postitorvenkatu 16, 33840 Tampere, Finland.

This paper presents a measurement campaign at a sugar refinery with a novel non-intrusive measurement technique for the crystallization diagnostics. The results presented and discussed include time trends for the crystal size, crystal growth rate, crystal content, suspension temperature and massacuite density. The aim of the paper is to highlight the potential and benefits achievable with this measurement technique.

By measuring batch-to-batch development of the key crystal properties, we demonstrate a quick and effective approach for crystallization control, monitoring and troubleshooting. The employed measurement technique combines in-situ process microscopy and advanced image

analysis. It provides real-time measurement of crystal size and shape distributions, crystal count and massacuite flowability directly from the boiling pan. The system is based on the principle of photometric stereo utilizing a digital color camera and three LED lights illuminating the crystal suspension from three directions. The measurement is performed through the boiling pan sight glass. As the instrument does not require direct contact with the suspension, there is no risk for contamination. The installation and any maintenance actions can be done while the boiling pan is operated. In addition, the instrument is truly portable in nature allowing quick studies on different locations and boiling pans.

The presented technique offers highly desired possibilities to optimize the crystal growth and the final crystal size distribution. The accuracy of the new technique is demonstrated by comparing measured crystal size distributions to the results obtained with sieving and traditional trans-illumination-based process microscopy.

12 YEARS OF SUGARCANE ANTIOXIDANT DEVELOPMENT FROM BENCH TO COMMERCIALIZATION - A CASE STUDY

#1214

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In view of the persistent need for the sugar industry to develop new products that 1) would appeal to the increasingly health-conscious population, and 2) would enhance the profitability of sugar production plants, a process was developed for recovery of antioxidants from sugarcane syrup/clarified juice/molasses, via laboratory experiment, pilot plant testing and eventually scale-up for commercialization.

The effectiveness of the sugarcane antioxidant product against peroxide radical - measured with, and not limited to, the Oxygen Radical Absorption Capacity Assay (ORAC) – compares well with and exceeds other

commercial antioxidant supplements.

The laboratory experiments were done at ASI of Louisiana state university and South China university of Technology, and GuiKang sugar laboratories, both of China. Pilot testing was carried out at a sugar mill of Taiwan sugar corporation and E.I.D. Parry (India) Ltd of India. Commercial production plant is installed at Sagay central, incorporated in Philippines in 2013. Part of products

characterization was done at USDA-ARS Southern Regional Research Center, 1100 Robert E. Lee Boulevard, New Orleans, Louisiana 70124, USA and National Institute for Agro-Environmental Sciences, 3-1-3 Kan-nondai, Tsukuba, Ibaraki 305-8604, Japan.
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A TECHNICAL ASSESSMENT OF A NEW CONTINUOUS ION EXCHANGE DECOLOURISATION PLANT AT THE TONGAAT-HULETT ROSSBURGH REFINERY

#1215

Ndinisa V[1], Jensen C[1] and Maharaj C[2]
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[2]Tongaat Hulett Refinery, 444 South Coast Road, Rossburg, 4094

The Tongaat Hulett Sugar Refinery in Durban has recently commissioned a continuous ion-exchange (CIX) plant which has become a third ion-exchange stage in its sugar refining process following the existing two fixed bed (FB) batch ion-exchange stages. This plant is a first continuous ion-exchange decolourisation plant in the South African sugar refining industry.

CIX offers several advantages over batch ion exchange such as reduced resin usage, lower water and chemical requirements, reduced effluent and sweetwater production, consistent product quality, and a smaller plant footprint. The CIX plant consists of 30 resin vessels containing 1.3 m^3 of resin each and has been designed to process up to 180 m^3/h of refinery liquor. At the heart of the CIX plant is the Tongaat Hulett and Ion-Exchange Separations RDA technology, which has a number of advantages over the conventional carousel-based CIX systems.

The plant was commissioned in November 2018 and has operated with time efficiency to date above 98%. A detailed operational comparison between the CIX and FB plants will be presented. The CIX plant has 39 m^3 of resin whereas the combined FB stages contain about 120 m^3, and colour removal efficiency is comparable for both systems. The CIX plant is using 74% less water than the

combined FB plant and is producing 63 % less effluent and 85 % less sweetwater. Part of this remarkable performance is linked to a water recovery facility that was incorporated into the design of the CIX.

Keywords: Continuous Ion-Exchange, Fixed Bed Ion-Exchange, Rotary Distribution System, Styrene Resin, Decolourisation.

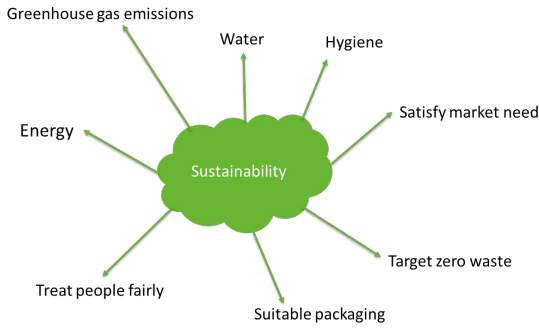
SUSTAINABILITY DRIVEN INNOVATION IN SUGAR PROCESSING

#1216

John Kerr, Tate & Lyle Sugars, ASR, John.Kerr@asr-group.com

Key Words: Sustainability, innovative processes, case study

Sustainability is a force for good in the production of food. It should not be viewed as an optional extra or a "nice-to-have" – rather, it is core to Good Manufacturing Practice, just as is the case with Safety and Quality. But what does this mean in practical terms? What does running a sustainable sugar process entail? Furthermore, how has a positive approach to sustainability led to innovative thinking and novel process technologies in the sugar industry? In this overview, several examples of key sustainability aspects are discussed – from where the crop is grown in the field, to its subsequent harvesting, processing and then delivery to the end user. One case study is discussed in more detail to illustrate a number of key points.



SPLIT & DUAL CONTINUOUS PANS - DESIGN ASPECTS FOR MAXIMIZING THE BENIFITS TO SUGAR MILLS.

#1217

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Split/Dual Continuous vacuum pans provides significant advantages such as complete automaton & minimal supervision, steam economy, better exhaustion, uniform crystals, high rate of evaporation, high through put and maximum capacity utilization. The design concept of Split continuous pans/Dual continuous pans has been developed by "M/S Shrijee process engineering works Ltd" to ensure the above benefits to the sugar industry.

The split continuous vacuum pan is having the flexibility to operate at 50% to 100% of the designed capacity in correlation with crushing rate and either side 50% of the pan can be taken for water boiling without stopping the complete pan. The dual continuous can be utilized for simultaneous boiling of any two massecuites or one massecuite boiling can be stopped and other massecuite can be boiled as per the requirement. Both split continuous pan and Dual continuous pans are having the provision to utilize the different pressure steam simultaneously at two different sides of the calandria.

These pans have been running successfully for A, B and C massecuites in India and overseas.

This paper shall emphasize several important design and operating criterion for maximizing the benefits of continuous pans to the sugar industry.

SYMPOSIUM B

BEST PRACTICES TO HAVE IN ORDER TO BE COST EFFICIENT IN ENERGY SAVINGS

#1218

POSTERS

THE RETURN OF CARBON BASED ADSORBENTS FOR REFINERY DECOLOURIZATION

#1219

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In the past 25 years, most major new refineries have been built using Granular Activated Carbon of Ion Exchange technologies. However, there has been a dramatic change in the refining landscape relating to financial, energy and environmental concerns. The former technologies have some disadvantages that are eliminated by the use of powdered carbon adsorbents, especially the new generation of high performance carbon based adsorbents. This poster will show a basic process diagram and point out the comparative benefits of each technologies.

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