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Council members being introduced to the Chief Guest on arrival for the function.

The Chief Guest performing opening ceremony of the Exhibition.
Shri S. C. Gopu, explaining to the Chief Guest.

Shri S. K. Somaiya, President, Gathting Shri C. Subramaniam.
Shri Genda Singh, U. P. Agriculture Minister being garlanded by the President.

Inaugural Address being delivered by Shri C. Subramaniam.
This Association was started in 1925. It is an organization of scientific workers and others directly interested in the technological advancement of the Sugar Industry. Its affairs are run by a Council elected each year by its own members. The Council is assisted by standing Committees on Research and Investigations, on Publications, on Off-Season Employment, on Uniform System of Chemical Control and on Indian National Committee of ICUMSA.

The Office of the Association is situated on premises kindly made available to it by the National Sugar Institute, Kanpur.

The Association endeavours to serve the Sugar Industry. It solicits your co-operation in this task.
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34th Annual Convention was held at the National Sugar Institute, Kanpur, on the 26th, 27th & 28th October 1966.

A large and distinguished gathering of members and visitors attended the session.

A list of the persons whose signatures were legible is given below.

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3. Shri Chandr Prakash
4. Shri R. P. Agarwal
5. Shri S. N. Ahuja
6. Shri V. K. Agarwal
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25. Shri H. L. Bhardwaj
26. Shri O. S. Bhatia
27. Shri S. S. Bhutnagel
28. Shri J. J. Bhagat
29. Shri J. P. Bahadur
30. Shri P. C. Bhardwaj
31. Shri P. C. Bhargava
32. Shri J. C. Barn
33. Shri B. L. Bhatia
34. Shri R. C. Bhandari
35. Shri A. L. Bhatia
36. Shri J. N. Bajpai
37. Shri Suresh Chandra
38. Shri V. K. Chatterji
39. Shri B. K. Chatterji
40. Shri Ramesh Chandra
41. Shri U. S. Cheema
42. Shri T. R. Chaturvedi
43. Shri Sutar Chandra
44. Shri M. M. Chhajjer
45. Shri Rohanlal Chandra
46. Shri C. Chandrasekaran
47. Shri K. Ramesh Chandra
48. Shri P. L. Chitkara
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221. Shri R. Sawhney
222. Shri Vinod Sharma
223. Shri Ashok K. Sharma
224. Shri K. S. Sandhu
225. Shri K. K. Sharma
226. Shri R. C. Singh
227. Shri M. K. Suri
228. Shri H. R. Sapra
229. Dr. J. P. Shukla
230. Shri R. P. Singhal
231. Shri M. C. Saxena
232. Shri P. B. Satsangi
233. Shri K. P. Singh
234. Shri S. C. Sharma
235. Shri S. K. Singh
236. Shri A. D. Sinha
237. Shri K. K. Srivastava
238. Shri J. K. Srivastava
239. Shri S. K. Tayal
240. Shri Z. Thomas
241. Shri S. L. Tondon
242. Shri D. B. Trivedi
243. Shri M. P. Trivedi
244. Shri R. B. Tiwari
245. Shri L. K. Trivedi
246. Shri J. D. Tanuja
247. Shri S. L. Tarte
248. Shri N. C. Varma
249. Shri K. N. Vaish
250. Shri N. K. Verma
251. Shri Yasho Verdhan
252. Shri D. K. Vasil
253. Shri R. P. Venugopal
254. Shri M. K. Vasil
255. Shri D. R. Vora
LIST OF COMPANION MEMBERS

OF

THE SUGAR TECHNOLOGISTS' ASSOCIATION OF INDIA

1. Ajudhya Sugar Mills Ltd.,
   Raja-ka-Sahaspur,
   Moradabad. (U. P.)

2. Andhra Sugars Ltd.,
   Tanuku. (West Godavri).
   (A. P.)

3. Ashok Sahakari Sakhyat Karhina Ltd.,
   P. O. Ashoknagar,
   (Ahmednagar).
   (Maharashtra)

4. Aruna Sugars Ltd.,
   Pennadam (S. Arcot)
   (Madras)

5. Assam Co-op. Sugar Mills Ltd.,
   P. O. Baruabamangao
   (Assam).

6. Amaravathi Co-op. Sugar Mills Ltd.,
   P. O. A. K. Puttur,
   Coimbatore.
   (Madras)

7. Amadavallasa Co-op. Agricultural &
   Industrial Society Ltd.,
   P. O. Amadavallasa,
   Distt. Srikakulam.
   (A. P.)

8. Amritsar Sugar Mills Co.,
   Rohana-Kalan,
   (Muzaffarnagar).
   (U. P.)

9. Burhwal Sugar Mills Ltd.,
   P. O. Burhwal
   (Barabanki).
   (U. P.)

10. Basti Sugar Mills Ltd.,
    Walterganj, Basti.
    (U. P.)

11. Basti Sugar Mills Ltd.,
    Basti. (U. P.)

12. Belsund Sugar Co. Ltd.,
    Rigba (Muzaffarpur).
    (Bihar)

13. Bihar Sugar Works Ltd.,
    Pacharkhi, Saran, (Bihar)

14. Bharat Sugar Mills Ltd.,
    Sidhwalla, Saran, (Bihar)

15. Brihan Maharashtra Sugar Syndicate
    Ltd., Shreepur,
    (Sholapur).

16. Belapur Co. Ltd.,
    Harigaon (Ahmednagar),
    (Maharashtra)

17. Bhopal Sugar Industries Ltd.,
    Sehore (Bhopal) M. P.

18. Bharat Pulverising Co. Ltd.,
    38-A Sayani Road,
    Bombay-28.
<table>
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<td>23.</td>
<td>Balrampur Sugar Co. Ltd., Balrampur (Gonda) U. P.</td>
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<td>Cauvery Sugars &amp; Chemicals Ltd., P. O. Box No. 12, Madras.</td>
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<td>Challapali Sugars Ltd., Challapali (Krishna) Andhra Pradesh.</td>
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<td>Cawnpore Sugar Works Ltd., Kastkuiyan, Deoria (U. P.)</td>
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<td>Chandeoo Sugar Mills Ltd., Mercantile Building, 60, Mahatma Gandhi Road, Bombay.</td>
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<td>Chittoor Coop Sugars Ltd., Chittoor (Andhra Pradesh).</td>
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<td>Chhatrapati Shivaji Sahakari Sakhar Karkhana Ltd., Bhavaninagar, (Poona).</td>
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<td>Daurala Sugar Works Ltd., Daurala (Meerut), (U. P.)</td>
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<td>Dhampur Sugar Mills, Dhampur (Bijnor) (U. P.)</td>
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<td>Deccan Sugar &amp; Abkari Co. Ltd., Pugalur (Trichinopoly).</td>
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<td>Diamond Sugar Mills Ltd., Pipraich, Gorakhpur, (U. P.)</td>
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43. Deccan Sugar Technologists' Association Ltd.,
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   P. O. Satara
   Dist. Satara.

44. Dudhganga Vedganga Sakhar Karkhana Ltd.,
    P. O. Bidri (Kolhapur).

45. E. I. Distilleries & Sugars Co. Ltd.,
    Nelikuppam,
    (South Arcot).
    (Madras)

46. Ganesh Sugar Mills Ltd.,
    Anandnagar,
    (Goa) (U. P.)

47. Godavari Sugar Mills Ltd.,
    Sakarwadi,
    (Ahmednagar).
    (Maharashtra)

48. Gwalior Sugar Co.,
    Dabra
    (Gwalior) M. P.

49. Ganga Sugar Corporation Ltd.,
    Deoband
    (Saharanpur).
    (U. P.)

50. Govind Sugar Mills Ltd.,
    Aira Estate
    (Kheri) U. P.

51. Gangapur Sugar Mills Ltd.,
    Raghunathnagar
    (Aurangabad).
    (Maharashtra)

52. Ganganagar Sugar Mills Ltd.,
    Sriganganagar
    (Rajasthan).

53. Ganesh Sahakari Sakhar Karkhana Ltd.,
    Ganesnagar (Kopergaon)
    Ahmednagar.
    (Maharashtra)

54. Girra Sahakari Sakhar Karkhana Ltd.,
    Dabholi (Nasik).
    (Maharashtra)

55. Gauribidnur S. S. K. Ltd.,
    Gauribidnur (Mysore)

56. Hindustan Sugar Mills Ltd.,
    Golagokarannath (Kheri)
    (U. P.)

57. Harinasgar Sugar Mills Ltd.,
    Harinasgar (Champaran)
    Bihar.

58. H. R. Sugar Factory (P) Ltd.,
    Bareilly.
    (U. P.)

59. Hiranyakeshi Sahakari Sakhar Karkhana Ltd.,
    Sankeshwar (Mysore).

60. India Sugars & Refineries Ltd.,
    Hospet (Bellary)

61. I. K. Sugar Mills Ltd.,
    Laxmiganj, (Deoria)
    (U. P.)

62. Jaswant Sugar Mills Ltd.,
    Meerut City, Meerut.
    (U. P.)

63. Jeypore Sugar Co. Ltd.,
    Rayagada (Koraput)
    (Orissa).

64. Jiwajirao Sugar Co. Ltd.,
    Dalauda, (Mandsaur) M. P.
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<td>Jagatjit Sugar Mills Ltd.</td>
<td>Phagwara (Punjab)</td>
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<td>Kesar Sugar Works Ltd.</td>
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<td>K. C. P. Ltd.</td>
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<td>Kolhapur Sugar Mills Ltd.</td>
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<td>Kopergaon Sahkari Sakhar Karkhana Ltd.</td>
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<td>Kirlampudi Sugar Mills Ltd.</td>
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<td>Kamlapat Motilal Sugar Mills Ltd., Bhatni Branch, Bhatni (Deoria) (U. P.)</td>
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<td>Kothari Sugar &amp; Chemicals Ltd.,</td>
<td>Post Box 267, Oriental Buildings, Armenian Street, Madras-1</td>
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<td>Kamlapat Motilal Sugar Mills Ltd., Motinagar Branch, Motinagar, Faizabad (U. P.)</td>
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<td>Kay Iron Works (P) Ltd.</td>
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<td>Kumbhi Kasari Sahkari Sakhar Karkhana Ltd., Kudite P. O. Tal: Karweer, Kolhapur</td>
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<td>L. H. Sugar Factory &amp; Oil Mills Ltd., Kashipur (Nanital) (U. P.)</td>
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<td>Lohat Sugar Works, P. O. Lohat (Durbhanga) Bihar</td>
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<td>Lord Krishna Sugar Mills Ltd.,</td>
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<td>Modi Sugar &amp; Oil Mills Ltd.,</td>
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<td>M. K. Sugar Mills Ltd.</td>
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Molipur Sugar Mills Ltd., Motipur (Muzaffarpur) Bihar.

90. M. P. Sugar Mills Ltd., Majhuila (Champaran), Bihar.

91. Maharashtra Sugar Mills Ltd., Tilaknagar (Ahmednagar) (Maharashtra).

92. Mysore Sugar Mills Ltd., Mandya (Mysore).

93. Mewar Sugar Mills Ltd., Bhopaisagar (Udaipur) Rajasthan.

94. Mahabir Sugar Mills (P) Ltd., Siswabazar (Gorakhpur).

95. Malegaon Sahkari Sakhar Karkhana Ltd., Malegaon (B. K.) Baramati, Poona.

96. Mohini Sugar Mills Ltd., Warisaliganj (Gaya) Bihar.


98. Malwa Sugar Mills Ltd., Dhuri (Sangur) Punjab.

99. Mahalaxmi Sugar Mills Ltd., Iqbalpur (Saharanpur) U. P.


102. Nawabganj Sugar Mills Ltd., Nawabganj (Gonda), (U. P.)

103. Niphad Sahkari Sahkar Karkhana Ltd., Niphad (Nasik), (Maharashtra).

104. New India Sugar Mills Ltd., Hasanpur Road (Durbhanga), Bihar.


106. Nizam Sugar Factory Ltd., No. 2, Shakarnagar (Nizamabad), (A. P.)

107. Neoli Sugar Factory Ltd., Neoli (Etah), U. P.


109. North Bengal Sugar Ltd., 8, Dalhausie Square East, Calcutta.


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<td>Parry &amp; Co. Ltd.,</td>
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<td>Prem Engineering Works,</td>
<td>Rani Mills (Meerut) U. P.</td>
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139. S. K. G. Sugar Ltd., Lauriya (Champaran) Bihar.

140. Shree Rama Sugar & Industries Ltd., Bobbili (Srikakulam Dt.) (A. P.)

141. Saswadmal Sugar Factory Ltd., Malinagar (Sholapur).

142. South Bihar Sugar Mills Ltd., Bibia (Patna).

143. Seth Govind Ram Sugar Mills Ltd., Mehidpur Road (M. P.)

144. Samastipur Central Sugar Co. Ltd., Samastipur (Durbanga) Bihar.

145. Sri Ram Sahkari Sakhar Karkhana Ltd., Phalton (Satara).

146. Sahkari Khand Udhyog Mandal Ltd., Gandevi (Surat).

147. Sakri Sugar Works Ltd., Sakri (Durbanga), Bihar.

148. Sanjivini (Takli) Sahkari Sakhar Karkhana Ltd., Kopargaon (Ahmednagar)

149. Shetkari Sahkari Sakhar Karkhana Ltd., Sangli (Maharashtra).

150. Shri Shadiyal Sugar & General Mills Ltd., Mansurpur, Muzaffarnagar.

151. Travancore Sugars & Chemical Tiruvella (Kerala).

152. Thiru Arooran Sugars Ltd. Vadapathimangalam P. O. Tanjore Distt. (A. P.)

153. Tulsipur Sugar Co. Ltd., Tulsipur (Gonda) (U. P.)

154. Tungbhadra Sugar Works P. B. No. 2, Shimoga, Mysore.

155. Upper India Sugar Mills Khatauli (Muzaffarnagar) (U. P.)

156. U. G. Sugar Mills Ltd., Seohara (Bijnor) U. P.


158. Ugar Sugar Works Ltd., Ugarkund (Belgaum).

159. U. D. Sugar Mills Ltd., Shamli (U. P.)

160. United Engg. Works, Bagbpat Road, Meerut City.
161. Vishnu Sugar Mills Ltd.,
   Harkhua (Saran)
   Bihar.

162. Voltas Ltd.,
   19, Graham Road, Ballard Estate
   Bombay-1

163. Vishnu Pratap Sugar Mills Ltd.,
   Khadda (Deoria)
   (U. P.)

164. V. V. S. Sugars Ltd.,
   Chagallu P. O. Krishna District
   (A. P.)

165. Walchandnagar Industries Ltd.,
   Walchandnagar
   (Poona).

166. Warna Sahkari Sakhar Karkhana Ltd.,
   Warnaagar (Kolhapur).

167. Yeswant Sahkari Sakhar Karkhan Ltd.,
   Akloj (Sholapur).

**FOREIGN MEMBERS**

1. Uganda Sugar Co. Ltd.,
   Lugazi, (Uganda).

2. Premier Sugar Mills Ltd.,
   Mardan (N. W. F. P.)
   (West Pakistan).
Shri S. K. Somaiya reading the Presidential Address.
PRESIDENTIAL SPEECH

By

SHRI S. K. SOMAIYA

President

At the 34th Annual Convention, Kanpur 26th October 1966

Distinguished Guests, Dear Brothers and Friends,

It is my pleasant and proud privilege to extend to you all a very cordial welcome to the 34th Annual Convention of the SUGAR TECHNOLOGISTS’ ASSOCIATION OF INDIA. We specially value our Annual Conventions and always look forward to them. These conventions are not merely formal meetings but provide to us—Sugar Technologists spread over the length and breadth of the country—an opportunity to come together, to discuss technological problems confronting the industry, to review and assess the work done during the year and set up problems to be tackled and the targets to be reached during the months to follow. It is indeed a gathering where meeting of minds takes place.

We are, therefore, particularly happy that you, Sir, who value work more than anything else and have laid down for your own self that rigorous discipline are in our midst today to inspire and guide us in our deliberations. We are grateful to you for having spared time despite heavy burdens of your office rendered all the more arduous and somewhat thankless at the present juncture. You, Sir, have not let your singleminded devotion to duty be affected by the passing turmoil and this indeed provides all of us a worthy example to emulate.

We are meeting for the first time after the passing away of our beloved Prime Minister Lal Bahadur Shastri. His life was one of dedication and selfless service; he led the country ably during perhaps the most trying phase of post-independent India. He was truly the people’s Prime Minister. Though he is no more with us, he has left behind him a shining example of simplicity and humility coupled with resoluteness of purpose. These are the qualities that make a nation great and democracy a success.

Friends, we are on the eve of the Fourth General Election. There is lawlessness and unrest in the air; with the “bandhs” in different parts of the country and the recurring agitation of the students, the general situation could not be worse. On the economic front, we are faced with serious problems the magnitude of which we cannot ignore. With devaluation in June this year, we have already exhausted a sharp edged and important weapon in our armoury and it would require a substantial effort by each one of us to lift the economy. Democracy appears to be on trial. And yet, given the will and the determination, there is no reason why we should not be able to preserve our democratic way of life and...
march onwards on the path of progress and prosperity.

Importance of Research

The Sugar Technologists’ Association, as you already know, was started in 1925. It has been serving the industry for over four decades now. No industry can continue to make significant and enduring progress in this fast changing world unless it is constantly alive and sensitive to the newly evolving techniques and practices. Research is a life-giving substance. It is to the industry what manure is to a plant. Without constant experimentation and research, the industry can only have an emaciated existence. This Association has so far published over one thousand research papers and conducted a number of studies. I want to assure you, Sir, that it would be the constant endeavour of this Association to pursue this all important task of continuous research and experimentation, to cut down costs, improve our efficiency and recovery, increase our cane yields and improve their quality, effect economies of fuel and steam and take rapid strides towards Betterment and Perfection of the Industry.

The fundamental aim of this Association is to raise the level both of Technologists as well as of Technology. Among other things, it is through the holding of Seminars that we endeavour to achieve this aim. I attach great importance to the participation of the technologists in the Seminars; for it is there that they come together in groups, exchange notes, discuss the latest developments, concentrate on selected topics, and learn what is happening around. Such a close participation by everyone is possible only in well arranged and purposeful seminars which is not feasible in annual conventions.

Hyderabad And Delhi Seminars

Recently, we had two seminars, one held in Hyderabad in July last and the other at Delhi last month. In the seminar held at Hyderabad—in which part of India incidentally we met for the first time—we concentrated our attention on the twin important problems of “manufacture of white sugar without sulphur” and “steam economy”. The first is basically and essentially a problem of import substitution and while its adoption suffers from various practical difficulties, it is being closely studied so that a way to a permanent solution may be found. The second study of “Steam Economy” is in keeping with the continuous effort to bring down the cost of sugar manufacture. The Hyderabad as well as Delhi seminars were both well received. The proceedings of these seminars are already printed and are with you.

The important conclusion of the Seminar on “Sugar without Sulphur” was that economically and qualitywise it is no substitute to classical sulphitation method. However, in total absence of sulphur, white sugar can yet be manufactured, though at extra cost primarily in terms of higher steam requirement and either with extra equipment or loss of capacity. Bolder grain sugar comparable to colour 29 and even 30 colour can be produced without sulphur if required, but at much higher incidence of cost.

Why Seminars?

By holding Seminars and Symposiums the Association is doing its bit to keep the
A torch of knowledge and research alive. Its Research Sub-Committees are concentrating on different topics. Very soon we are going to have a Branch of the Association in the South so that it could concentrate on the regional problems. In such a vast country as India having varying climate and weather conditions, problems have to be studied in the context of the region. And besides, we want every sugar manufacturing region in the country to be alert and active and to raise its technological level.

Permit me to state that apart from these seminars being useful in themselves, they provide an important link between the work done at the National Sugar Institute and the practices as actually applied in the factories. For the success of these seminars, it is highly essential that the Faculty of the National Sugar Institute be fully associated with these seminars. In fact, participation in such seminars should become an important function and role of the National Sugar Institute, as what the seminars intend to achieve is really an extension of and the fulfilment of the objects of the N.S.I. itself. The present administrative set-up and the regulations should be made flexible as to permit active participation in this useful activity. I am sure, Sir, you will have this matter looked into so as to ensure active co-operation and participation of the Institute in this vital sphere.

Foreign Visits Essential

While on the subject of Seminars and Research, I would like to refer here to another aspect which is often lost sight of, particularly in the present difficulties of foreign exchange. Research and knowledge know no frontiers. While each technologist must continuously keep in touch with what is happening elsewhere in the world through magazines, papers and journals, he must occasionally get an opportunity to enrich his knowledge by personally visiting what brother technologists are doing in different parts of the world. After all, seeing is believing. Therefore, foreign exchange should be made available for such study teams or visits of the technicians. I would strongly urge that a team of at least 18 or 20 technologists is sent by us to the next International Congress of Sugar Technologists. I can confidently say from personal experience that much of the work done on Godavari plantations in increasing the cane yields and also of the modernisation of sugar factories in Maharashtra and other states owes its inspiration to the visits of our technologists to foreign countries. Mr. Gundu Rao’s visit to Canada to clarify points of doubt in respect of quality of raw sugar also indicates the necessity of such visits. The amount spent in such visits will be earned many times more if one or two important techniques are found suitable and adopted.

Regional Sugar Institute

In the overall context of the need of raising the level of Technology I would very much welcome the move to have a Regional Sugar Institute suitably located in the South. I trust that we shall soon have a favourable and positive recommendation from the committee specially appointed to go into the question of setting up of a Regional Institute. Fundamental research need not be duplicated and should continue to be carried on at the National Institute. I visualise this Regional Institute as an autonomous body primarily
controlled by the Industry and geared to the specific needs of the Industry. Its main function ought to be to provide speedy extension services manned by qualified personnel of long experience in securing whose services salary should not become a limiting factor. In short, the Regional Institute should be modelled on the lines of some of the International Institutions, though catering to the needs of a defined specific area. I am sure, Sir, that you will lend your helping hand to this very desirable scheme, and will see to it that it takes concrete shape soon.

Topics Studied by S. T. A.

I may take this opportunity to briefly refer to a few important topics studied by the Association. These may have been mentioned in the past, but they would bear repetition. The most outstanding studies have been on (i) "Middle Juice Carbonation" effecting reduction in limestone consumption, saving of hard coke; better clarification efficiency and slightly higher recovery in carbonation factories; (ii) "Deionization of cane juice clarification" which is a commendable process but having the limitation of availability of Resins and (iii) "Continuous filtration in carbonation process" effecting economies in working.

We, as an industry, have been able to achieve a satisfactory record of manufacture of "Raw Sugar" satisfying the requirements of the importing countries in respect of uniformity of size of the grain, reducing sugars, colour and ash content. This is good so far as it goes. We must still continuously try for achieving better results.

Cane Diffusers

Another important advance which may have great potentialities is the installation of "Cane Diffusers". The extraction of juice by cane diffusion as an alternative for milling juice out of cane, while not novel, is not yet adopted in India. The diffusers have been in use in Egypt since long and new designs have been developed in Holland, Germany and U. S. A. A cane diffusion plant has been installed in Belapur Co. Ltd. at Harigaon, Belapur and another version of it at Shriram Sugar Factory at Phaltan. The results achieved by them will be watched with great interest. If these diffusers could give an extraction of 97 to 98 p. c. without proportionate import of non-sugars, it will be a great break-through and may almost revolutionise sugar manufacture in the country.

Targets Reached

Friends, we are in the first year of the Fourth Five Year Plan. The sugar industry has already achieved the Third Plan target of 35 lakh tonnes. This industry has the proud record of exceeding the 1st and 2nd Plan targets and I am sure, the target of 45 lakh tonnes set for the industry during the 4th Plan would also be easily reached. In achieving this target, the Sugar Technologists' Association must concentrate its attention on areas likely to yield the most fruitful result with the minimum of cost to the country at large. Sugar is an agro-industry and one such area, nay, by far the most important area, is increasing our cane yields. We have a woefully low all India average of 18 tonnes per acre. Sugar per acre in India at 1.7 ton compares very unfavourably with Hawaiian figure of 9.1 tonnes. It may be observed that some farms in Maharashtra with advanced cane technology, have nearly reached the Hawaiian figures. If we were to merely double Indian
average, not merely the Fourth Plan target would be more than reached, but that the some would be achieved without diverting any land from food crops or other crops.

Sugarcane Technology

It may be trite but it is true that "sugar is manufactured not in the factory but in the fields". To improve the quality of our cane and grow the most suitable varieties is as important as increasing our cane yields. No sector of sugar technology to my mind is as vital as research in sugarcane technology. The results achieved in Maharashtra on the mechanised and integrated large-scale farms of the joint stock factories are not entirely the results of kindness or bounty of mother nature. They are a direct result of sustained application of scientific methods and research to cane cultivation. What has been achieved in Maharashtra can as well be achieved in other regions.

The importance of easy availability of agricultural inputs in raising productivity can hardly be overemphasised. Given identical climatic and soil conditions, yields are a direct function of timely and systematic cultural practices. Irrigation, fertilisers, agricultural implements and good quality seeds are the basic needs of a cultivator. Today, many a cultivator cannot get the desired yield because he does not get the required fertilizers. When he gets them, it is generally too late. The cost of raising the crop is also directly related to the cost at which these inputs are made available to the cultivator. I am sure, these requirements would always be kept in view so that the efforts done at all levels in enhancing our yields bear the desired results.

I would like to mention here that efforts of the industry in the sphere of improvement of cane technology are naturally limited by the size of the farms of the factories and the holdings of the cultivators. One of the important recommendations of the Seminar on Sugarcane held in Delhi last April under the auspices of the Indian Sugar Mills Association which you had so kindly addressed was that the Factories should be enabled to take up Cane Development work. This can be done through Research Stations and Demonstration Farms. The factories should provide extension services to their cane growers. They should become nucleus of advanced cultural practices and centres for dissemination of knowledge. Their set up should be modified to fit in with this desideratum.

The work done by the Factory farms of the Joint Stock Factories in Maharashtra in providing extension services to the neighbouring cultivators and in conducting research on their own farms is well known. They were an important bridge between the fundamental work done by the State Research Stations and the actual practices in the fields. They were the centres of applied research in the real sense of the term. Yet perhaps the first step taken by the Maharashtra State Farming Corporation after the take over of these farms under the Land Ceilings Legislation is to close down these research sections. Any comment is superfluous. The recent D. S. T. A. Convention held in Poona revealed that papers on agriculture which initiated and accelerated great advance in cane technology in Maharashtra are now becoming a rare thing.

Outline for Future

Sir, the year that has ended has been a unique year for the sugar industry. While it will be remembered for the record produ-
ction the industry achieved, it will also be remembered for the preparedness it has made to reach the Fourth Plan target. During the year, advance licensing was already started and an additional capacity of 9.3 lakh tonnes had been licensed or approved for licensing by way of 17 new sugar factories (including 16 co-operatives) and expansions in 89 existing units. With this the licensed capacity of the industry has gone up to 43.5 lakh tonnes.

The actual production of sugar during the 1965-66 season up to August 31 has been of the order of 34.80 lakh tonnes, while expectations of the remaining two months are for a production of about 70,000 to 80,000 tonnes. This means the total output for the season will be in the neighbourhood of 35.50 to 36.00 lakh tonnes against 32.60 lakh tonnes in 1964-65 and 25.67 lakh tonnes in 1963-64. The internal releases for the season are expected to total 28 lakh tonnes as against 24.70 in 1964-65 and 22.98 in 1963-64. Exports during the current season are expected to be higher around 4.30 lakh tonnes against 2.75 lakh tonnes in 1964-65 and 2.62 lakh tonnes in 1963-64. The current season opened with a carry forward stock of 6.72 lakh tonnes. Assuming that the total production of sugar this season will be 35.50 lakh tonnes and internal consumption and exports will be about 28 lakh tonnes and 4.30 lakh tonnes, the season is expected to end with a sizeable surplus of 9.92 lakh tonnes or roughly 10 lakh tonnes.

We cannot however afford to be complacent as sugar industry has been quite familiar with the cycles of shortages and surpluses. As it is, the latest estimates for the season that is now commencing indicate an overall fall in sugarcane crop to the extent of 15 p.c. A slightly lower sugar production in the coming season with a comfortable carry over of 10 lakh tonnes may not pose the problem for the next year. Yet the industry will have to keep itself vigilant to see that its performance continues to remain even and satisfactory.

On the international front, sugar has experienced the wildest fluctuations ever experienced by any commodity. As members perhaps know, the prices have reached an all time bottom of £.15 per ton in the international market from the all time high of £.105 in 1963. Despite the devaluation we can barely cover half the cost of cane at the present prices. While the present situation must improve, we cannot afford to lose our place in the international market and therefore all efforts would be necessary to see that we get sizeable quotas in the International Preference Markets in keeping with our sugar potential.

Cost Reduction

This brings us to the paramount necessity of cost reduction. With the rising prices of all materials, with a demand for a higher sugarcane price, with an insistent demand for higher wages, with a Second Wage Board now in session, I am aware that we can achieve precious little on this front. And yet there are areas technical and technological, on which we must concentrate to bring down our costs. It will be a revelation for many to know that as against 4.65 man hours required per ton of sugar in Hawaii, we in India require 83.4 man hours. It is against this background that we have to tackle this problem of cost reduction which
unfortunately is rendered all the more difficult by the levies imposed on sugar. This second largest industry in the country has the somewhat unique distinction of being the most closely controlled and the most heavily taxed. With the last increase in excise duty to Rs. 37.00 per quintal, the total levies of the State and Central Governments would amount to over 50 p. c. of the cost of production.

Utilization of Byproducts

It is essential for the well being of the sugar industry that proper utilisation of its byproducts is ensured. Two important by-products of sugar viz. molasses and bagasse have lent themselves to potentialities which hold immense promise. I trust that the plans for paper industry and the particle board industry at different centres utilising bagasse and for which licences have been issued will take early shape. Bagasse is also being used for manufacture of certain components of automobile industry. I also hope that the Alcohol Chemical Industry which has taken firm roots will be allowed to develop and diversify in different spheres.

Of late in certain quarters a bias has been created against the use of alcohol as raw material for chemical industry, particularly in view of the emergence of the petro-chemicals, even where alcohol is a suitable raw material in the Indian context. While I do not wish to go into this matter at length here, I would only like to say that any trends which create conditions of setback in the use of alcohol as raw material will be neither in the national interest, nor in the interest of the sugar industry. Alcohol has proved an excellent raw material of chemical industries and its continuous use as such has to be ensured in the interest of all concerned. Similarly any factors which would tend to increase the price of alcohol should be discouraged as otherwise it would impair its competitiveness and strengthen the bias against it. Alcohol is a wholly indigenous raw material with ever expanding sources of supply. Any scheme of utilisation of this raw material within the country should be promoted and encouraged.

Existing Units not to be rendered weak

Permit me to refer here to an important point which has a bearing on the health of the industry. The Development Council for Sugar Industry has accepted 2000 tonnes as an economic size for a sugar plant. It is common sense that the cost of creating new capacity through expansion is much less, almost less than half, when compared to installation of new units. Depending on cane availability and cane potentiality, expansions should be freely permitted up to 2000 tonnes capacity. When, however, a new unit has to be sanctioned, it has to be ensured that it is not in a close proximity of an existing factory or does not affect cane supplies of that factory. In this connection your following observation is unexceptionable and axiomatic:

"It must be recognised that in drawing up plans for establishment of new factories, meticulous care should be taken to see that there is not only enough sugarcane available for the proposed factory but also that it does not encroach upon the areas which have been serving the existing ones."
Notwithstanding the above, instances are happening where units are licensed or expansion in capacity to certain units is granted without taking into consideration the cane requirements of nearby factories for their existing and normal expansion needs. We have to take care to see that existing units are not rendered idle or weak. I am sure, Sir, that you will kindly look into instances where such imbalances are created.

**Adequate Return Essential**

By far the most important of the recent events in the sugar industry are the reports of the Sen Commission and Gundu Rao Committee. While I do not propose to deal with their recommendations, there are one or two aspects which I should like to touch upon. To my mind one of the basic recommendations of the Sen Commission is in regard to the basis for fixation of sugar price which is far from realistic. To fix 12 per cent return on capital employed as the basis in determining sugar price when the cost of capital currently is so high and exorbitant is to ignore the realities of the situation. Such a return would hardly be sufficient for declaring reasonable dividend, much less for creating reserves for rehabilitation and improvements. Our efforts at improvement and technological advance are directly related to resources that industry can make available for activities of research and experimentation. While the need to protect the consumer price fixation must leave sufficient return for adequate growth and development, this situation prevails in most of the industries where prices are controlled. We need to fundamentally re-examine our approach to price fixation and adequacy of return; otherwise there would be diversion of scarce rupee resources to non-essential industries.

**Multiplicity of Agencies Undesirable**

Another recommendation of the Sen Commission which is not in the right direction has been about multiplicity of the agencies for controlling different facets of the industry. A number of unco-ordinated agencies working without an integrated picture may lead to confusion. It does not appear to have been properly appreciated that sugar policies to be effective should be viewed and dealt with as one comprehensive harmonious whole. Arising out of this recommendation, it has been suggested by the Commission that the export of sugar should not be handled as at present but should be entrusted to some other agency. To my mind there is no justification whatsoever for taking away of the handling of export from the Export Agency Division of the Indian Sugar Mills Association. If the records of exports are examined, it would be seen that it is primarily due to vigilance and active effort of the sugar interests that we have been able to make a mark in exports and secure our place in the preferential markets. I would therefore appeal that before any action is taken in this direction, the implications of the suggestion may be carefully examined.

**Speedy Rehabilitation Necessary**

The problem of smaller and weaker units also requires to be energetically handled on the lines indicated by the Gundu Rao Committee. The units that are already existing must be enabled to contribute to the national economy and therefore their claim to rehabilitation and
modernisation cannot be overlooked. A fantastic suggestion was recently made in some responsible quarters that such units should be allowed to die, nay the whole sugar industry should be shifted from the North to the South. The suggestion would have been considered comic, had it not emanated from a responsible person. The fortunes of several lakhs of growers and workers are inextricably involved in the well-being of industry in the north and apart from its utter impracticability, even a consideration of such a proposal could result in a conflagration. I hope the Government will take early steps in setting up a Revolving Fund to enable the weaker units to come up to an optimum level.

Gentlemen, I must thank you for having listened to me patiently. Nobody denies the importance of research in this enlightened age. We however often tend to overlook the importance of its application into practice. Research is not an end in itself. It must subserve human well-being and progress. I am sure that in our day to day life as well as in our deliberations and seminars we shall always keep before our mind this ideal of translating research into practice so that the benefits of research are reaped by the consumers and the community at large.

May I now request you, Sir, to inaugurate this convention?
INAUGURAL ADDRESS

By
Hon’ble SHRI C. SUBRAMANIAM
Union Minister of Food and Agriculture

Friends,

I am glad to have this opportunity once again to inaugurate the Annual Convention of the Sugar Technologists’ Association of India. Your Association renders a great service in emphasizing the role of technology in increasing output, improving quality and reducing costs. It is a truism to say that there is a direct relation between the prosperity of a people and the extent of application of science and technology to their agriculture and industry. But curiously, it is the most obvious that most often one requires repeated and reminded. Occasions like this provide an opportunity for such reminders. I am, therefore, happy to be with you who have gathered to exchange views on the various problems of development in the agro-based industry-sugar.

The central objective of our economic planning is the building up of a self-reliant, self-generating economy. This requires that our productive processes and equipment should keep pace with the latest developments in the field of modern science and technology. Necessary research facilities have been provided in national laboratories and some very useful work done. There is, however, need for planning of scientific research and development as a whole in a purposeful way to strengthen basic research, training of research personnel and reorienta-
often leads to inbreeding of ideas affecting dynamism and diversity of thought and action which is most essential for scientific development. A Committee was therefore set up to examine the question of starting a regional institute for the Maharashtra and the Southern region. The report of the Committee will merit close and careful consideration.

Research and training apart, development of efficient modern managerial skills in adequate numbers is a basic prerequisite for successful functioning of industries, particularly modern and sophisticated industries. I have said on previous occasions and I may repeat it here that technologists must also pay increasing attention to the science of modern management techniques. Besides their scientific and technological qualifications they must develop equal fitness to hold managerial posts in industrial enterprises. In many advanced societies engineers and technologists who have acquired proficiency in managerial skills are holding charge of important industries, and their advice is valued in the planning bodies and forums. I am convinced that the managerial posts in sugar factories must be manned by specialists prepared to experiment with the modern techniques and methods for improving production and lowering costs.

I am glad to learn that your Association has started holding seminars and symposia in different parts of the country to discuss the technical problems in detail. This is a healthy development and I wish you success in your efforts. It has been suggested that the Director and other Professors have been taking active part in the celebrations of your Seminars. The exchange of views at such meetings is beneficial both to the Association and to the Institute. I can assure you that the Institute will continue to participate in these useful activities in as large a number as possible within the limits of available resources.

I have noted the suggestion made by you that a team of about 18 to 20 technologists should be sent to the next Congress of the International Society of Sugar cane Technologists. None could doubt the utility of such exchange of experience and personal contacts. In view of our tight foreign exchange position, however, it may not be possible to send a very large delegation. But I shall try my best to send as large a delegation as possible.

In regard to technical efficiency of sugar factories, it is gratifying to note that the Association has been devoting its attention to the development of new and better techniques in sugar production. We shall watch with keen interest the results achieved by you especially in the field of installation of cane diffuser which is reported to have great potentialities.

The year 1965-66, the last year of the Third Plan, was a year of severe economic strain. An unprecedented drought resulted in a shortage of supplies of agricultural commodities including food grains with added difficulties of imported raw materials and spares due to continued difficulties of foreign exchange. Sugar industry is one of the few industries which showed a higher production during this year in spite of various disadvantages. The production of sugar has touched the Third Plan target of
nearly 3.5 million tonnes, the highest so far achieved. It is indeed a great credit not only to the farmers who produced the sugarcane, despite unfavourable weather conditions, but also to the factories and the technologists in making the best use of available supplies. The reports at present available, however, indicate that next year there is likely to be a decline in sugarcane production in some of the major sugarcane producing States which may result in a lower production of sugar. Although a clearer picture will be known after some time. I hope, by proper planning and also perhaps using better technology, it should be possible to maintain sugar production at the 1965-66 level.

The target of sugar production to be achieved by the end of the Fourth plan has been fixed at 4.5 million tonnes. It is envisaged that within this target, it would be possible for us to export up to 7.5 lakh tonnes of sugar depending on world market conditions. In this connection the point raised by Shri Somaiya will have to be taken note of. The international price of sugar, from £1.05 it dropped to 1/7th i.e. £0.15 per ton. This only shows that developed countries are exploiting the under-developed and developing countries, who have to depend upon them for the export of their primary products. As a matter of fact this is one area in which developing countries and producers of primary products can come together and perhaps dictate some terms to developed countries with regard to the selling of these primary products. And I am glad in this connection that the recent Tripartite Conference have laid emphasis on the economic collaboration, not between the developing and developed countries but between various developed countries. There is a good deal of room not only for collaboration in the field of technology and agriculture but even in the field of trade. If the developing countries are united together perhaps these will be in a position to extract better terms for their products in the developed countries. At the same time perhaps it will be useful to reconsider, whether to produce exportable sugar and go on exporting sugar in such a low price or we may have to produce other commodities which may have better international market. Unless we know the reorientation of our economy to the developing conditions in the world, we will find ourselves at a disadvantage. Therefore while export is necessary and export promotion has to be done, even at cost, at what cost this has to be decided and if it is going to be the export of sugars at levels of £0.15 per ton, I am afraid, we will have to revise our ideas with regard to the export of sugar. Out of the capacity licensed in the sugar industry against the Third Plan target, an effective capacity of about 32.5 lakh tonnes would have been installed by the first year of the Fourth Plan. An additional capacity of 12.5 lakh tonnes would be needed to reach the Fourth Plan target. Advance licensing was started in 1965, licenses or letters of intent have so far been issued for establishment of 20 new sugar factories, of which 18 are in the cooperative sector in different States covering a total capacity of 3.5 lakh tonnes of annual sugar production. Besides, expansions have also been allowed in 88 existing sugar factories, both joint stock and cooperative, involving an additional capacity of 6.3 lakh tonnes of annual sugar production. The total capacity so far approved by way of new factories and expansion of existing ones comes to 98 lakh tonnes of sugar. The balance capacity is
expected to be licensed soon. While availability of financial resources might be a problem which the licensees will have to face, I have no doubt the sponsors of the new units and expansions will make determined efforts and tap all resources available.

In this connection we have already taken up matter with the Planning commission and Finance ministry that in a planned economy sufficient resources will have to be allocated for the purpose of attaining the target fixed for the various sectors in the industry. Therefore plan it in detail the resources from which sugar industry has to draw for the purpose of expansion of the existing units and for new units. In this the ingenuity and skill of technologists can help in establishing new capacity with speed, economy and efficiency. Application of new techniques and innovations in the equipment and process so as to reduce cost, improve efficiency and effect import substitution wherever possible, must be the guide line of expansion of the industry. I am aware that sulphur shortage has caused some handicap in production of high quality white sugar. But I must tell you that the problem of sulphur is not only scarce foreign exchange, there is a global shortage of the commodity itself. In the circumstances, the technologists must find a solution to this problem so that the manufacture of good quality sugar without sulphur may be possible within a foreseeable future. When I was going round the exhibition organised in this Institute, I was told that it will cost a little more to produce sugar without sulphur. Therefore it will have to be examined whether an incentive should be given to such factories which do not use sulphur for the production of sugar so that in the near future this new technique may be taken up by as many factories as possible.

The new process of sugar manufacture without sulphur recommended by the National Sugar Institute must be given a fair trial.

In the context of the devaluation of the rupee, certain follow up action and 'neutralizing' steps became imperative. One of the major tasks is to boost up export. The export of sugar, as you are aware has had to be subsidised by grant of cash assistance. Even after devaluation this assistance will have to be continued as the international price of sugar has fallen in the meantime which has almost offset the effect of devaluation. I mention about this and the Chairman also made a mention of this. Further, due to the excess supply position, there is an intense sellers' competition and the buyers are offering less advantageous terms now. Therefore there will have to be a planning of sugar production not only in India, it will have to be an overall planning of all sugar producing countries so that we may not over produce and there results a keen competition and it becomes a buyers' market and they dictate terms. The developing countries who are among the major exporters are very badly affected by this slump in the market which is accentuated by the future plans of development of some of the developed countries-plans which aim at self-sufficiency within a group or an area. We are a member of the International Sugar Agreement since 1961 and have joined recently the Commonwealth Sugar Agreement also. The latter gives us access to the preferential markets of U.K. and Canada on a regular basis. Despite difficulties, our export performance has been fairly impressive. Our major handicap is the high cost of production as compared to the...
international prices. I would urge the technologists to give their best towards reducing the cost of production of raw sugar to the maximum extent possible. I do hope that impelled at once with scientific curiosity and patriotic zeal, our sugar technologists will evolve methods and processes to bring down the cost of production of sugar. I need hardly emphasize on the urgent need for better utilization of the valuable byproduct of the sugar industry like bagasse and molasses which will also go a long way in bringing down the cost of sugar production.

Apart from this I know the cost of sugarcane required to produce one ton of sugar is another limiting factor. We recently made calculation and found that our sugarcane alone costs much more than international price of sugar. Therefore whatever might be the economies in the production of sugar from cane, ultimately it depends upon the sugarcane economy before we will be able to compete in the international market. It is in that direction that we have to devote our attention, for better sugarcane production and in that connection the Chairman mentioned the competition between the new types of grains which have come into the fields today and sugarcane. I am glad about that competition, because without competition no body can make any profit whatsoever. It is sugarcane production which has its higher level of production which grow the grain producers to adopt better techniques and to reach the higher levels of production. Now with high breeding cost and with new varieties the crop varieties in paddy and wheat the levels of production with regard to these grains would be at a much higher level. Now emphasis as on having multicrops during one year, where there is only one crop in a year efforts are being made and have to be made for two crops and even three crops there, wherever possible. Therefore the productivity of land with regards to these grains is bound to increase many folds. Therefore sugarcane can compete with the production of these foodgrains only if they improve their technique or technology.

Therefore this is a warning and it has been a fore warning given to sugarcane industry also, if they want to survive as an industry they will have to improve the technology of sugarcane production. Therefore for the survival of the sugarcane industry while they will have to look to technology of the factory, as well they will have to look to the economies of the sugarcane production also. As now the sugarcane production is 18 tons per acre you are not going to compete with other foodgrains. In the north it has got to come to the levels of at least Maharashtra production or Mysore production of the individual good farmer of the area. I am sure our scientists and technologists will evolve good varieties and new techniques for growing more and much more cane per acre in the northern area. Otherwise whether we have new factories here or not ultimately the economy will have its own law, and no government can bear it and see that inefficient production sustained particularly when we want to have three consecutive crops in a year. Therefore I hope this morning it should be taken note of not only by the sugar factories but also by the Ministers of agriculture of U. P. and Bihar. Unless they take action sufficiently in advance for the production of sugarcane and particularly the cane cess they are collecting is used for the development of
mne, the condition of sugar industry in the north is bound to deteriorate within a few years.

We have reached a very crucial stage in our planned development. To the extent we are able to implement the Fourth Plan, we shall come nearer the cherished goal of building up a new society. But this demands a great deal of effort on the part of the Government and the people alike. What is needed is a common national will to do so which should inform all aspects of our productive activities. Sugar industry will, I am sure, under the spell of this national urge, and if I may say national competition spur itself into loftier heights and greater achievements, thus contributing its mite in taking the nation towards the goal of a socialistic society wherein the people would be assured of at least the basic minimum needs for a healthier and happier life.

Thank you very much for having listened to me so patiently.

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Discussions on articles of the 34th Proceedings 1966 of the Sugar Technologists’ Association of India

Article "A note on the problem of production of white sugar without sulphur" by D. P. Kulkarni. (Ref. 34th Proc p. 49)

Mr. S. N. Gundu Rao

I would like to draw the attention to one thing and that is when you melt and recrystallise, recrystallisation is very rapid and it is confined to the top of one or two grains of massecuites where you get most of the crystallisation out and therefore the type which is involved is not that much. If you process it quickly it will be a high grade recycle only which will be recirculated. Only thing will be factors related to temperature, of heating the melt and of making the melt and pH of the water used for making the melt. These are the things which also received simultaneous attention. If these things are controlled mechanical losses are prohibited. I am sure the loss would not be that much otherwise you make all the calculations required when it comes to question of increasing the melt. We melt the double cured C, double cured B and take hopper seed only and make the finished sugar. The balance of melting if you take into account and then consider that recrystallisation is only in the first stages and crystallisation is very much and more rapid, I think it has not been assessed and figure not given but there is no need to fear.

Dr. B. B. Paul

There is one danger and that is by grainising in a high purity liquor, the massecuite cannot be tightened. The massecuite Bx. must be low as a result, the molasses percentage from massecuite to molasses will be higher in a high purity medium and that will increase the total loss also.

Mr. S. N. Gundu Rao

Dr. Paul, is talking of exhaustibility. I can tell you that we have boiled upto 100% massecuite in melt boiling by the way Mr. Kulkarni has brought in and the final molasses purity did not change. By adjusting the number of boilings the recrystallisation takes place in the higher stages without effecting the exhaustibility.

Mr. D. R. Patashar

The author has given certain observations which may be difficult to adopt. In the first instance he has mentioned that C double cured sugar should be used for B boiling and A boiling.

A boiling single cured sugar should be used with melting of A and B and then A massecuite must be formed. C sugar is boiling on a graining medium of A heavy molasses. This has to be considered whether this footing medium will transport colouring matters from C to B, from B to A and A to the finished sugar and whether single cured A could be consumed in moltings of B and C.

The second aspect the author has mentioned is 'Loss of sugar', for a sulphitation factory with S J M formula by taking
C sugar alone, the formation of A massecuite will be about 55%, B massecuite about 25% and C massecuite about 20%. If by recovering sugars from C and B massecuites, by melting sugars of B and C massecuites alone, loss is 0.08% and not 0.02 to 0.04% mentioned by some speakers.

Mr. S. N. Gundu Rao

In this observed process which gave a better quality of sugar at Ravalgaon, the principle behind this process was that instead of low grade melts which are mixed with syrup ensued that the quality of melt is good by proper washing and melting, if necessary with water and then store that melt. We used to take particular care of the melt and store it separately and making sure that the melt would be adequate for the finishing of sugar and no further crystallization was done. For this purpose, the quantity of melt required will not be great. The only principle the author has brought out is that in case DMC process is adopted involving melting without sulphur, the better course would be to reduce the meltings. There is no need of melting the entire A massecuite and then recrystallise. Keep the A massecuite grain as such, wash it well, store low grade massecuite melt separately and then try to finish in such a manner that there is a little washing off of the colour. The adoption of this procedure would improve the quality of sugar by one grade.

Regarding the losses

Of course when you talk of adding the melt as such there is no extra melting envisaged in the normal B and C that is the low grade. When it comes to the purity of high grade you are not going to boil the melt as it must become A and A-1 with difference in the grain size.

That is the little advantage envisaged by the modification and benefit pointed out by the author.

Article "Entrainment and Bentrained Liquor" by Ajit Singh (Ref. 34th Proceedings, pp. 53-55)

Mr. Ajit Singh introduced the article.

Mr. S. C. Sharma

By referring to the article it is observed that as the briq goes on increasing, the purity goes on decreasing but after a certain briq, it starts increasing. It appears probably that the low purity of the entrained liquor might be as a result of fermentation in the save alls or in the collection vessels.

It is also mentioned that the above observation leads us to believe that entrainment is not a simple phenomenon of throwing away small droplets of liquor out. I would request the author to clarify his above statement.

Dr. B. B. Paul

I think the author's observations are correct, interpretation may be different. When the author segregated the evaporator from the low grade pan and collected the entrained liquor and analysed it for its briq and purity, it was found that the briq and purity were less as compared to the entrained liquor obtained from the evaporator and pans. This may be due to presence of more of volatile organic matter which escapes with the vapours. This is the condensation of the volatile organic matter along with the entrained liquor which is responsible in reducing the purity of the entrained liquor.
But if, in the pans, the sugar material is carried over by the vapours its brix and purity will be more as compared to the evaporator liquors.

Mr. B. L. Mittal

Our observation is that the purity, of the entrained liquor depends on the purity of the liquid on which entrainment takes place. From the pans the purity of the entrained liquor was almost equal. The fall in purity of the liquor as pointed out by the author may be due to inversion or fermentation of sucrose. I would request the author to give design features of the save alls and whether these were examined for any contamination during the season or at the close of the season.

Mr. H. A. Shah

I would like to understand one thing, though Dr. Paul assumes that fractional distillation of certain components takes place but why the purity should come down and sucrose content effected. Secondly even if it is assumed that fractional distillation takes place in the last body which is at a very low temperature, then these components should have been distilled at higher temperature and why these have been distilled in the last body.

Mr. D. R. Parashar

The author has given interesting observations which we also come across sometimes. The observations cannot be said to be conducive as there was a common catcher for the C boiling pan and the evaporator. There is likelihood that when the catcher was cut off from the C pan, some molasses may be sticking to the vapour pipe or the catcher. The author should have fixed a separate tell-tail pipe to the vapour pipe with the evaporator alone and then noted the observations. The purity sometimes does not tally with the entrained liquor. If the brix is 3 or 4 one should not bother about it. The purity of the liquor cannot be co-related with any factor what so ever.

Mr. Ajit Singh

I entirely agree with Mr. Parashar that the observations are not conducive. It requires more experiments to be done before any definite conclusion is drawn. With that end in view the article has been presented so that you may also check up in your factories the actual position.

Regarding Mr. Shah's point about more volatility at less temperature it may be noted that at the same time vacuum was high.

Regarding deterioration of the entrained liquor, on analysing the same sample after a couple of hours the observations were almost similar to those when analysed before. This showed that there was no deterioration. The fellow technologists may also check up this in their factories.

Article "Recovery of Sulphur Dioxide from Stack Gases of Sulphiter" by Biraj B. Paul and Arnab K. Mitra (Ref. 34th Proc. Part I, pp 57-62)

Article "Further reduction of sulphur consumption in Carbonation Sugar Factory" by Man Mohan and K. K. Sharma.

Dr. B. B. Paul and Mr. Man Mohan introduced their respective articles which were taken up together.

Mr. D. R. Parashar

The design of the sulphur tower by Dr. Paul is based on the conception that
SO₂ gas present in the waste gases varies from 4 to 6%. This is a very queer observation because for using 0.025% sulphur in a carbonation factory if we are going to waste so much gases, I think our furnaces and compressors are not working properly. The observations taken by us are contrary to Dr. Paul's observations.

In the next paper of Mr. Man Mohan, there the authors say that the drop in pH of clear juice was from 8.6 to 7.9 or 7.7 which is too drastic a fall. This shows that there is too much wastage of gases going out in the chimney. By properly controlling the tray area, air pressure and fitting a cock at a place where the juice falls from the tower into the tank and recording the pH of the clear juice it was found that it was hardly 0.2 whereas the authors say it was 0.8 to 0.9. This means our furnaces and compressors need modification.

Secondly I would like to know as to how the difficulty of foam formation and its removal can be effected in Dr. Paul's design.

The claim of Dr. Paul that the sulphur consumption came down from 0.025 to 0.018% when there was irregular supply of juice and syrup in the sulphitators and with regular supply the consumption came down to 0.012% is not correct. 50% reduction by this measure only which is not possible.

In the second article the authors say that by triple carbonation they reduced pH of the clear juice from 8.6 to 7.00 or 6.8. From my own experience in the laboratory pH could not be brought down below 7.5, I would like the authors to throw light on this aspect.

Mr. S. C. Jolly

I would like to know from Dr. Paul how he has assumed 68.7 lbs/hr. of sulphur produces 137.4 lbs/hr of SO₂ gas and 60% of this gas is absorbed in the sulphitor and the gas flow rate has been taken as 200 lbs/hr ft² of the tower cross section.

Regarding the point raised by Mr. Parashar about the design, at Yamunanagar there is a similar system but a bend is also provided which prevents foam formation.

In the second article I endorse the views of Mr. Parashar that on third carbonation pH of clear juice could not be brought down below 7.5 or 7.4. On heating this juice to 100°C it was observed that pH again became 8.6 or so. I would like to know from the authors their comments.

Mr. S. C. Sharma

For the recovery of SO₂ gas from the stack gases we have got for the sulphitator of syrup a standard design with brass tubes within the tower which is just like a packed column. For the clear juice there are no brass tubes in the tower and the waste gases going out of the syrup are diverted to the tower where the clear juice is falling. With this system saving of sulphur is 0.005%. It would also depend upon the absorption system in the existing tanks also. Mr. Man Mohan mentioned that in the design of Dr. Paul they had the trouble that the gases could not go out of the chimney. I would request Dr. Paul to elucidate this point. Then the area of the slots of the plates is also important to know the pressure built up by the stack gases.

Mr. D. R. Narula

Regarding sulphur consumption and recovery tower, in our carbonation factory,
by putting up a recovery tower and changing the baffle plates in the tanks and reducing the tray area of the sulphur furnaces, the sulphur consumption was reduced by 50%.

Mr. S. K. Singhal

I would like to know from Mr. Man Mohan if they have studied the effect on the quality and quantity of final molasses.

Mr. T. C. Jhingan

Pointed out that by shifting the sulphur furnaces and air compressors near to juice and syrup sulphitation vessels and putting baffles as no baffles previously were provided in the vessels, saving in sulphur consumption could be effected.

Dr. B. B. Paul

Regarding the basic assumptions which have been made in the paper, I would like to confirm that the data have been taken from standard chemical engineering books and international critical tables; 46% concentration of SO₂ in stack gases is by weight and not by volume and it is mentioned in the article. Absorption of gas is proportional to the number of stages and 60% absorption is max. in a single stage absorption tower. Regarding the point raised by Mr. Parashar, I must say that the facts and figures given in the article are correct and it cannot be ignored that sulphur consumption at Furala was 0.024% and average consumption for the season was reduced to 0.018% and minimum obtained was 0.015%. The fall in pH of clear juice reported in the article is correct and there can be no dispute regarding the facts.

Regarding the inefficiencies mentioned by Mr. Parashar, I would like to inform the house that the operational deficiency for tower absorption system and the burner will be there so long as human element is involved in it.

I would say that it is impossible to reduce SO₂ content in the stack gases to zero as mentioned by one of the speakers. Unless the number of absorption units is increased very much the SO₂ content of stack gas cannot tend to zero. In my opinion in sugar industry where single stage absorption is followed it is impossible to reduce the SO₂ content of the stack gas to 0.02% or less.

Regarding foaming, during sulphitation it may be possible to reduce the quantum of foam by introducing a syphon in the system.

Some technologists have mentioned use of CO₂ gas in place of SO₂. Third carbonation may be possible if juice is carbonated and juice filtered to remove insoluble calcium carbonate salts. By carbonating the clear juice, it is possible to reduce the pH. The effect of using CO₂ in the juice sulphiter has yet to be looked into.

Regarding Mr. Jolly’s question I would like to remind him about the lb. molar system, 32 lb. mole of sulphur yields 64 lb. mole of SO₂ gas; for safe design the gas flow has been assumed at 200 lb/hr. per feet square area of flow.

Mr. Man Mohan

Mr. Parashar has pointed out that sulphur consumption was brought down to 0.009 by making changes in compressors and burners only. We have to point out that we could bring down the consumption:

1. From 0.025 to 0.018 by installing a recovery tower.
2. From 0.018 to 0.012 by providing a bend to avoid exit of gases.

3. From 0.012 to 0.009 by using CO₂ through for a short period of 4-5 days.

Secondly regarding bringing down pH to 6.7 or 7.00 by CO₂ alone, we have to mention that the juice is first passed through the recovery tower where it does absorb some SO₂ and we have observed a pH of 6.7 by carbonating the juice. More experiments will be conducted next season.

Regarding Mr. Jolly’s point whether we observed pH of juice after heating in the quad, this aspect was not looked into.

Mr. Sharma wanted to know if we carbonated after filtering the juice, we have to say that it was the clear juice which was carbonated.

Regarding Mr. Narula’s point regarding effect of CO₂ on clear juice in presence of carbonate, bicarbonate and on colour etc. in this connection we have to mention that due to shortage of time this aspect was not gone into.

Mr. K. K. Sharma

It is possible to bring down pH of clear juice from 8.5 to 7.00 by CO₂ alone but the pH does not remain stable at higher temperatures and reverts back to 7.6 on account of the stable buffer formation. The only disadvantage can be destruction of reducing sugar. This point is under our consideration.

Dr. N. A. Ramalal

This work was done in our laboratory at NSI in connection with the modification of the carbonation process to be adopted by the factories for the manufacture of raw sugar as a prerequisite for the DMC process. It was possible to reduce the pH to 7.6 under stable working conditions in a factory. In the laboratory as pointed out by the technologists from Daurala pH could be brought down to 6.4 pH but this never remains stable for all the reasons pointed out by them. The moment the temperature is raised CO₂ escapes and the equilibria shifts to stable equilibrium of about 7.6 pH on account of the physico-chemical considerations involved in dissociation.

There is another apprehension that on the formation of carbonates, the precipitate is formed and this is not so as there is no physico-chemical demand for the formation of the precipitate. All these aspects were well discussed in one of our papers published in the ‘Indian Sugar’.


In the absence of the authors the article was taken as read.

Mr. J. S. Husa

In this article the authors have taken certain figures for calculation of mill settings from the data of Tromp and other authors. The authors have taken certain figures for bagasse which comes out and certain factors on page 91 i.e. 0.50, 0.40, 0.34, 0.30 etc. The general opinion about these calculations is that these serve as a guide, and actual setting of a particular mill has to be found out by experience and the particular quality of cane that is being crushed at the particular time. But the basic calculations are necessary for arriving at certain openings.
of the mills. By drawing the brix curves working of the factories can be improved.

Mr. S. C. Sharma

The authors have assumed that the bagasse density varies from 75 to 79 lbs/cft. I do not think these figures are actually achieved, specially the crusher and the first mill, while in the case of the 3rd and 4th mill, these are too low as the density of the bagasse is taken at 100 to 120 lbs/cft. I would request Mr. S. L. Saxena to throw some light on this.

Mr. C. D. Malhotra (Hardoli)

The figures as given by the authors were found by me by the Java method which is easier.

Dr. B. B. Paul

I would like the engineers to try differential diameters rollers in some mills as in a particular mill besides compression, shearing of the material is also required for better extraction.

Mr. C. D. Malhotra

In the factories the diameters of the rollers are kept the same as far as possible. But when they are worn out the arrangement is like this i.e. feed roller is the smallest, next top roller and the biggest is the discharge roller and this arrangement gives satisfactory results.

Mr. Ajit Singh (Daurala)

The proper openings between the rollers is also very necessary for satisfactory working of the mills.

Mr. G. R. Athawale

My observations on the paper are that the densities of bagasse mentioned are too much on the low side for calculation purposes. Actually the densities should be more and there should not be two opinions about that. If the actual density is calculated from the volume consideration it would be much higher because the juice which is separated from the bagasse is travelling at a much higher velocity than the bagasse (solid matter) itself. So the apparent density of bagasse which is coming out becomes much higher than the compressions to which it has already been done.

Regarding the use of differential rollers, the feed roller has bigger opening than the discharge roller. Therefore when the gears of the rollers are worn out then the considerations of having the small diameters for the feed rollers becomes more important.

Mr. S. L. Saxena

In this paper the densities of bagasse taken at 75 to 79 are on low side except for the first mill or the crusher. By experience, the density of the bagasse of last mill may safely be taken as 120 lbs/cft. If calculations are made on the basis of densities at 79 or so, the setting of the mills will become too wide and adjustment thereafter becomes very difficult. Our experience has been to take density for the last mill 100 lbs, 85 to 90 for last but one mill, and 75 lbs/cft for the first mill in case of cane of low fibre and in the case of high fibre 75 for the crusher.

Article "Theoretical possible recovery of raw sugar in a white sugar factory when switched over to raw sugar manufacture" by B. B. Paul (34th Proc. Part I pp 67-71)
Dr. Paul introduced the article.

Mr. S. N. Gundu Rao

By remelting and crystallisation there will not be so heavy loss of sugar if proper care is taken of the stages of boilings, final exhaustion of molasses and leakages etc., is feared. As we require quality therefore gradually melting is increasing coming to a stage of 45, 48 or even 50% of massecuite. There is no denying the fact, by increasing meltings there will be increased loss. Melting and recrystallisation is the normal process of improving the quality of sugar.

Dr. B. B. Paul

I fully agree with the observations of Mr. Gundu Rao. So long as the melt purity is higher than the magma purity the colouring matter of the non-sugars can be mobilised from the crystal lattice to the mother liquor. But it is difficult if the melt purity is less than the magma purity as the colouring matter cannot be mobilised to that extent as it should.

In D. M. C. process you cannot remove colouring matters. On melting loss of sugar will be 5%.

Mr. Man Mohan

I suggest that experiments on the use of activated carbon may be conducted in the NSI with a view to replace sulphur in the sugar factories.

Dr. S. K. D. Agarwal

I would like to say a few words on the manufacture of refined sugar from raw sugar. In New York I visited two factories, one manufacturing 'sucrot sugar' and the other Domino sugar. Sucrot sugar was manufactured by removing colouring matter through ion exchange resins and reboiling the melt with purity of 59 or 99.5 and the pan was boiled in 20 to 25 minutes. For Domino sugar activated carbon and filter cell were used. The quality of both the sugars was roughly of the same order. So it is worth while trying melting of the whole sugar and use of activated carbon for improving quality.

Mr. B. L. Mittal

Dr. Paul's assumption that the film of A-heavy molasses is the extra recovery of sugar is not correct as the film contains both recoverable and non-recoverable sucrose.

The claim of Dr. Paul about extra recovery of sugar due to less formation of molasses is also not correct.

Mr. S. C. Sharma

Instead of adopting a lengthy procedure which Dr. Paul has adopted in calculating the extra sugar by switching over to raw sugar manufacture this could have been found out simply by applying S. J. M. formula. Dr. Paul's claim of extra recovery of sugar i.e. 0.7 to 0.8% is not correct.

Mr. D R. Parashar

The formula advanced by Dr. Paul has not any virtual importance so far as calculations are concerned. Extra recovery could be calculated even without applying S. J. M. formula.

Mr. Singh (Yamunanagar)

The author has presented certain calculations for extra recovery due to less production of press mud. In sulphitation
factories the press mud is the contribution of the inherent coagulated matter and the Ca (SO)\textsubscript{2} due to addition of lime. The press mud due to addition of lime is of the order of 0.4%. As such it should be 0.4% figure which should reduce and not the entire press mud as given in the calculation. I would like Dr. Paul to throw light on this point.

Mr. S. N. Gundu Rao

This is a very important paper and certainly it is so because it gives rise to quite a bit of disturbance in the present understanding and achievement in the sugar factories. Regarding the claims for extra recovery advanced by Dr. Paul unfortunately as pointed by other speakers as well there has been some confusion in the overall concept about the increase in recovery as to how it takes place. Some of the basic errors in calculation which could have been done or arrived at have already been pointed out by various speakers. In calculating the difference between white sugar recovery and raw sugar recovery all the exercise that is needed to be done is to think of a concept in which the raw sugar consists of white crystal sugar which in any case will be produced at 98 or 100% purity surrounded by a film of molasses which goes out or has the purity of final molasses or in other words it carries a non-sugar to sugar ratio corresponding to the purity of the final molasses. As such the results reported by Dr. Paul based on misconception, are wrong.

If you remember there had been a lot of controversy about the evaluation of raw sugar for purposes of refinery in U S. A. The varying raw sugar producing factories evaluate on the basis of 34 to 36 pty. of final molasses but the refineries approach is to assume that this molasses film surrounding the crystal is exhausted to a standard purity and that is how calculation of raw sugar on an equivalent standard basis excluding the molasses film done and assuming that this molasses film is exhausted, at 28.5 and this basis has become an International standard for comparison.

Similarly here whether the crystal is surrounded by A heavy or B heavy molasses, it is ultimately the crystallisable sugar that is in the raw sugar and the exhausted molasses that is emerging which should be taken into consideration.

Dr. Paul

I differ with the concept which has been advocated by Mr. Gundu Rao. The S. J. M. formula which we use is not a reversible formula. By reversible I mean, from refinery to raw sugar. The refineries will destroy the non-sugars which are usually exhausted to the final molasses. In that case this S. J. M. formula is alright.

But in a white sugar factory by switching over to the production of raw sugar it operates in a reversible process. S. J. M. formula is incapable of handling any loss or gain in raw sugar during the manufacturing process. Whenever non-sugars are bled out from the intermediary stages this formula fails. That is why I thought, that the molasses which is adhering to the sugar crystals is physically coming from A heavy molasses and B heavy molasses and so the factors should be associated with A heavy and B heavy molasses. But when the raw sugar is subjected to refining process, non-sugar will be exhausted to the final molasses only. So a part of the recoverable sugar will be associated with Pol and there is no
denying the fact. But my basic point was
that the sugar which is bagged from A
massecuite and B massecuite, the molasses
which adheres to the crystals are A heavy
and B heavy molasses and this must be con-
sidered in calculating the recoverable
sugars.

Mr. S. N. Gundu Rao

I agree with you on the point that the
molasses film accompanying the sugar are
A heavy and B heavy. But to think that
the increase is going to be 0.6, 0.7 or 0.8 as
claimed is absolutely incorrect and puts
the factories producing raw sugar at a very
serious disadvantage. I wish Dr. Paul
appreciates from that particular aspect. If
even after this Dr. Paul feels that his extra
recovery of 0.6 or 0.7 is correct, I am afraid,
we shall have to record a protest because
that is going to effect the industry very
seriously.

Mr. S. L. Gupta (Maholi)

In Maholi, Hargaon and Gola sugar
factories so long as white sugar is manu-
factured the recovery is almost the same.
But when they start manufacturing raw sugar
recovery goes up by 0.4, 0.5%. So my
feeling is that theoretically the results of
extra recovery reported by Dr. Paul may
be true.

Mr. S. K. Somaiya (President)

Desired that further investigations
should be conducted during the coming
season so that the true picture may be known
next year and desired the application of
sucrose balance, instead of pol balance.
But in future I would request the authors
that for such articles which may lead to con-
troversy, the results must be thoroughly
checked and examined before publishing
such articles.

Article "Power in the Sugar Industry
(A comparison of mill drives) by F. J.

In the absence of the author the article
was introduced by Mr. D. K. Choksey.

Mr. J. S. Huja (Sakarwadi)

In this paper the author has given the
advantage of the turbine drive over the
conventional horizontal mill engines and in
the end the author recommends M's Belliss
& Morcom's vertical engine. As a matter
of fact for the sugar industry where we have
low pressure boilers i.e. 200-160 lbs. the
mill engines are working fairly well and
there are other advantages of mill engines
also. For a mill engine if it is designed for
500 H. P. with certain alterations, higher
horse power can be developed and this
advantage is not available with turbines. At
Mawana factory my own experience has been
a mill engine designed for 450 H. P. as high as 700 was developed.

Secondly I would like to know if
M's Belliss & Morcom Co. has supplied
the vertical engines to a sugar factory and
its economies.

Mr. G. R. Athawale (Kanpur)

The vertical engine drive supplied by
M's Mirrlees Watson was to a sugar factory
at Mount Ridge Combe in South Africa about
25 to 30 years ago. I think this is the only
high speed engine drive supplied so far.

Regarding the statement of Mr. Huja
in connection with adjusting of the horse
power of the turbines, perhaps that may be
possible by having two sets of nozzles in the turbines. One set could be blank at the start if full power is not required, and additional nozzles could be put out while putting additional mills or requiring additional power.

Secondly if there are low pressure boilers and the prime movers are intended for low pressure, for that it may not be possible to put up a turbine for additional power. So with the high speed engines, which could take saturated steam even, it may be possible to provide additional power by putting a high speed driven mill.

The author in this paper has not mentioned that 450 r.p.m. speed will have to be reduced to 120 r.p.m. while actually our mill engine speed is of the order of 60 or 80 r.p.m. So this reduction from 450 to 60 r.p.m. may not be quite possible with ordinary spur type of gears. But a double helical gearing is necessary if it is required to do in a single stage. I am not aware of high speed gears we are making in India at the present moment.

Mr. D. K. Choksey (Belliss & Morcom (India) Ltd.)

On page 104 of the Paper the sentence beginning with Figure 4, and ending with the word "slide" should be deleted and, furthermore, the Table given on page 105 should also be deleted.

In reply to Mr. J. S. Huja's question regarding the installation of vertical steam engines in sugar mills, and the economies resulting from the use of the vertical steam engine, we would comment that our Principals have supplied and installed a number of vertical steam engines for mill drive sugar mills in Africa.

The vertical steam engine possesses many advantages over the horizontal steam engine in that it occupies considerably less space provided the steaming conditions do not exceed 250 lbs. per sq inch, dry saturated, and the power required does not exceed 400 B. H. P. The vertical steam engine forms an ideal prime mover for a mill drive under these conditions.

Article "Use of Phosphate in clear juice" by A. C. Chatterji (Ref. 34th Proc., pp 109-111).

In the absence of the author the article was taken as read.

Mr. B. L. Mittal (Bareilly)

By addition of superphosphate in the clear juice at the rate of 0.006% on cane by weight there was definitely improvement in the quality of sugar and the final molasses purity was comparatively less and the scaling in evaporator was also soft. It was also observed that the invert sugar loss was much less.

Dr. N. A. Ramaiah (Kanpur)

A few years ago a paper was presented at the STAI convention on 'Role of Phosphate on the destruction of reducing sugars in factory operations, The observations related to:

(a) Phosphate addition decreases destruction of reducing sugars: By the above observation our conclusions were.

(i) That the exhaustibility should increase

(ii) The colour formation should be less, giving rise to the quality of sugar.
(iii) Phosphate increases the solubility of the calcium salts which leads to the conclusion that scale formation in the evaporator tubes will be less.

The results presented by Mr. Chatterji, corroborate our previous findings and Mr. Mittal also supports our findings. I wish more technologists should experiment on the use of the phosphate in their respective factories for collecting more data on this aspect so that we may have a generalised suggestion to the other factories as well.

The factories which want to improve the exhaustibility of molasses should have $P_2O_5$ to the level of 150 to 200 mg/litre in clear juice whereas Mr. Chatterji and Mr. B. L. Mittal have reported $P_2O_5$ content in 50 to 60 mg/liter in clear juice.

Mr. D. R. Parashar (SKG)

I would like to know from Dr. Ramaiah how there could be increase in recovery by about 1% merely by the addition of superphosphate as given in the paper.

Regarding settling characteristics the author has written “After stopping phosphate addition to mixed juice, Oliver filter had to stop for some time in every shift to allow the thin mud to settle”.

I would like to know from Dr. Ramaiah how he would explain this aspect of addition of superphosphate instead of mixed juice to the clear juice.

Mr. K. K. Sharma (Daurala)

Dr. Ramaiah has said that scale formation is reduced by the addition of phosphate in clear juice, the observation is correct to a great extent but I have to point out another aspect. By addition of phosphate in the doses as prescribed based on the consideration of solubility products that no precipitate formation occurs in the clear juice, is correct. But when concentration of juice takes place in the last body of the quat to an extent of 60 Bx, the phosphate becomes super-saturated and is thrown out in the form of a precipitate. I would like Dr. Ramaiah to throw light on this.

Dr. B. B. Paul (Thapar group)

About addition of phosphate my observations are that addition in mixed juice does not help much. It was then added in the sulphited juice before that is sent to the Dorr and then tried in the mixed manner also i.e. some in mixed juice and some in sulphited juice. By addition of superphosphate in the clear juice the pH goes down but it does not increase the inversion rate provided glucose/ash ratio of that particular region is less. It is correct that the inorganic salts help in determining the inversion rate. I would like to know as to what would happen if the reducing sugar content is more and the glucose/ash ratio is high.

In one of our factories by adjusting the addition of super phosphate and phosphoric acid, the quality of sugar considerably improved but too much foaming in syrup and sometimes even when sugar was dissolved in water was observed. I would like to know from Dr. Ramaiah if he has also experienced foaming as above.

Mr. S. C. Jolly (Yamunanagar)

In a sulphitation factory for better clarification still new idea has been that if $P_2O_5$ is present in the mixed juice to the
extent of 400-420 mg/litre, then there is no need of addition of extra phosphite and if at all that has to be added that is done during clarification. In the absence of the requisite P₂O₅ content in the juice, the mud will be thin and if the superphosphate is added in the clear juice, there will be a gradual fall in pH. This fact has not been brought out by the figures given in this article. So there will be inversion after the addition of phosphate and the juice passes through the quadruple effect evaporator.

The claim of the author that there will be increase in the recovery is not correct rather there will be difficulty in the operation of the clarification system.

Mr. C. Chandrasekaran (Kothari)

In our factory where the mixed juice was having requisite amount of P₂O₅, on the suggestion of Dr. Ramaiah, supernatant liquid from the phosphate slurry was added to the clear juice before it was going to the quad. There was definite drop in pH. As such pH of the clear juice we had to maintain 0.2 higher. We also observed that there was improvement in scale removal from the evaporator.

Dr. N. A. Ramaiah

On behalf of the author I should apologise for the brevity of the paper which does not refer to the details published in the previous communications. It is thought that by a reference to the previous publication the entire body of the matter will be clear to the readers. It is with this view perhaps that the author has confined himself to a few experimental observations or factory findings that he had in drawing conclusions with the help of the theoretical aspects behind his investigations. Many have pointed the addition of phosphite to the mixed juice. This aspect has nothing to do with the subject under consideration. The paper refers only to the addition of the phosphate supernatant clear solution to the clarified juice.

Regarding the date reported by Mr. Chatterji, the difference is due to the differential period or time of investigation of the addition of the phosphate. In our previous publication we have never claimed any rise in recovery of sugar and what we tried to achieve was drop in purity of the final molasses by 1 to 1.5 units.

Regarding drop of pH we do agree that there will be drop in pH by the addition of phosphate though the phosphate itself has no property of bringing down the pH, yet the phosphate that we get is usually mixed with sulphuric acid which drops the pH. As a result of this the pH of the clear juice will have to be kept 0.2 higher than required when phosphate is added.

Regarding foaming of the syrup as pointed out by Dr. Paul if requisite amount of phosphate is added, there will not be any foam formation. In the case referred to by Dr. Paul foaming might be due to excessive addition of phosphate to the juices. Dr. Paul referred to the glucose ash ratio and the effects when it increases. Much work has been done earlier and it is shown beyond doubt that with increased glucose ash ratio, the exhaustibility of molasses increases.

Regarding the point of Mr. Sharma about heavy scale formation in the 4th body of the quad, this can be explained by saying that when once the solubility increases...
there is no possibility of the material being more thrown than what was occurring in the absence of phosphate. In other words the precipitation of salt constituents in the fourth body occurs to a less extent in presence of phosphate. One should expect that some phosphate will also be present in the scale.


Mr. Juneja introduced the paper

Mr. D R. Parashar (SKG)

I would like to know from the authors if they have established any correlation between sp. conductances and visual tests of Indian standard sugars. If there is no correlation then what is the practical importance of this article in relation to the Indian Sugar Standards.

Mr. S. C. Sharma (BIC)

I want to know from the authors that while finding out the conductance of the various sugars whether consideration for the size of the crystal has also been taken.

Mr. S. K. Somaiya (Chairman)

What do the authors mean by impure molasses layer.

Dr. N. A. Ramaiah (Kanpur)

Regarding the points raised by Mr. Parashar and Mr. Sharma did attract our attention long back. Four years ago we took samples from the same massecuite after purging and centrifuging sugar, then steamed it and then analysed those impure constituents that would remain in the crystals. To the naked eye, it appears grain whiter than the A grain though obtained from the same massecuite and purging system. From that point of view we wanted to find out whether the impure constituents namely the colour and the conductance or the ash constituents would differ from the bolder grains to the smaller grains. Some of the observations on page 221 of 34th Proceedings show that impurities are the same for known weight of different grain sizes.

Regarding impure molasses, the word ‘impure’ refers in relation to the constituent of sugar crystal. According to theoretical considerations we expect only sucrose should form the constituent of sugar crystal. During crystallisation, however, the mother liquor, namely molasses, invariably and unavoidably enters the crystal, especially in between the crystal layers. It is shown that crystals grow layer by layer. The molasses or mother liquor non-sugar, more correctly, non-sucrose constituents are referred to as impure molasses film.

The main object of the investigations is to develop a simple conductometric method for determination of ash in raw sugars.

Article “Splitting the Multiple Effect Evaporator” by S. K. Ghosh (34th Proc. pp. 137-143)

Dr. S. K. Ghosh introduced the article.

Dr. B. B. Paul

In this article Dr. Ghosh says that by splitting up the quintiple effect evaporator...
rating remaining the same, steam economy can be effected, I would like Dr. Ghosh to throw some light on it.

Dr. S. K. Ghosh

Let us take a quintiple for example. It has a steam economy corresponding to say 1/5th while that in the quadruple effect is 1/4th. If now a vapour cell is added to the quadruple, the steam economy of the combined set up will be better than that of quadruple alone because the addition of vapour cell bleeding vapour to other stations almost amounts to providing extra heating surface for the 1st body. The question now is that, can the steam economy for the combined set up equal or be better than that of the quintiple. The analysis presented in this paper shows that for the steam economy of the combined set up of quadruple and vapour cell to equal or to better than the quintiple, it is necessary for the evaporation rate per unit area in the vapour cell to exceed that in the quintiple.

Dr. B. B. Paul

On page 141, in the table the author has given evaporation rates for the various evaporators, in my opinion the data needs revision as at a fixed initial steam pressure the evaporation rates will depend on the total temperature difference.

Mr. Man Mohan (Daursala)

For effecting steam economy and bleeding vapours instead of splitting the evaporator, I would say that one more body of a bigger size should be added. In this way by adding one more body to a quad, that can be used as a quintiple effect as well as for bleeding vapours.

Mr. S. P. Misra (Walterganj)

Much controversy has arisen about the performance of the vapour cell. A very important aspect has been forgotten about the velocity of the juices. When the cruising rate increases the velocity also goes up and velocity is a contributing factor to heat transmission and higher heat transmission coefficient. In this particular case while considering a quadruple effect evaporator split up into a vapour cell and triple effect evaporator, the capacity goes up by 25% and the velocity would go up by 33% and heat transmission coefficient as assumed by Dr. Ghosh and commented upon by Dr. Paul appears to be on lower side. In a Maharashtra sugar factory the coefficient was as high as 10 to 12 lbs rating from the pre-evaporator. This is quite feasible.

In addition to the above ∆T is also the guiding factor.

In this case the effect of scaling has not been taken into account.

The conclusion drawn by Dr. Ghosh about fuel economy is feasible.

Mr. R. L. Jeneja

There is controversy about the splitting up of the first body. If the vapours which come out of the 1st body are taken to the pan, the story will be different from the case if these are taken to the 1st body of the triple. If the vapours are taken into the pan then economy in steam is possible but if the vapours are taken into the triple then that triple behaves like a quad and there is no saving.

Mr. S. N. Gundu Rao:

In the installation of the vapour cell two aspects have to be considered, one is
that capacity increases and the other is economy aspect. After hearing the views of the various speakers, I am inclined to agree to both the views. But the only thing is this that when we consider a specific example which is before us, one of splitting up a quadruple into a vapour cell and a triple effect evaporator, the question of heat transmission and over all temperature differential that is available for evaporation has to be taken into account. Of course it has rightly been observed when we operate a vapour cell generally we shoot evaporation rate to 8-10 lbs/sq in. In a normal quad this differential gets distributed divided by four. If the pressure in the calandria of the 1st body is at 8 and vac. at 25", the overall differential could be about 20 lbs/4=5 lbs. This is the differential per body. The other argument is that of falling evaporation rate with the scaling in the last body and the smallest body or the weakest body in the evaporator deciding the overall evaporation in the system as a whole; taking these factors into consideration, even assuming that the evaporator is completely clean, the differential per body would be of the order of 5 lbs. or the differential between the steam pressure in the 1st body and vacuum in the last body divided by 4. The question of economy would be if we can improve upon this differential and get a higher evaporation rate from the isolated body. That we are able to maintain high evaporation rate 8-10 lbs. which you cannot get if it is a quadruple even if you maintain the same differential.

Regarding economy, as a quadruple you would get 1/4 lbs of steam per lb of water evaporated and if you take it to the pan floor it will be a saving of 1 lbs. So according to the equation it is the same otherwise by vapour cell there may not be that much steam economy but there will be greater evaporation rate. If to a quadruple is added a vapour cell the situation would change.

In most of the advanced sugar producing countries the practice is to have increasingly vapour bleeding and no steam at all either in the vapour cell or the evaporator.

Dr. S. K. Ghosh

Through apparently differing, the various opinions expressed are not greatly divergent from that expressed in this paper. Before explaining the various clarifications, I want to emphasise that the numerical value regarding the evaporation rates per unit area for different multiple effects mentioned in this paper and which has drawn certain amount of controversy are not the real subject matter of this paper. They serve here only to decide the limiting cases where the application of the analysis mentioned in this paper though theoretically possible is not practically feasible. It is common knowledge that these rates, other things being equal, will depend on the terminal conditions of pressure and vacuum and on the number of effects. I, therefore do not want to divert away on an issue which is not
the subject matter of the paper beyond saying that the values expressed are neither too high nor too low and have been attained in many factories.

Reverting back to the subject, the present paper is not dealing with steam economy aspect as such, but is a comparison of economies in the two cases of evaporator set up. Further there is another subtle difference which has to be understood in order to appraise the real object of this paper. The analysis in this paper is equally applicable whether a vapour cell is added to multiple effect say quadruple and then compared to a quintuple effect in matters of steam economy or a quintuple is compared after split up to a quad and vapour cell, but the emphasis has been laid on the latter comparison. The underlying object here is that when the evaporator station in a factory has become the limiting factor say for allowing certain degree of expansion, can the multipal effect be split up to enhance the capacity of the station without disturbing the level of steam economy as existing before the split up. If this can be achieved, it is then possible to enhance the capacity of the evaporator station without any investment and without the steam economy being disturbed. The analysis shows the steam economy after the split up will remain undisturbed or can be better if the evaporation rate/unit area in the vapour cell equals or exceeds that in the mixed set. In applying this principle in the practical field certain limitation arises. The triple effect having a much higher evaporation rate per unit area than the quad, the vapour cell evaporation rate, in pursuance of this principle, has to be higher in the case of splitting of a quad than in the case of a quintuple. The scope for utilisation of higher amount of vapour being limited, the splitting of quintiple and higher multiple effects is a more feasible proposition than the quad and below. Hence I am in full agreement when doubts have been expressed on the practicability of splitting of a quadruple effect. But for quintiple and higher effect the analysis is true from the practical point also.


The above Articles were introduced by Dr. S. K. Ghosh

Mr. D. R. Parasbar (SKG)

I am not going into detail into the merits of this process but the concept of this process has to be now again revised and the flaws which might creep in according to the present circumstances have to be looked into. On page 150 the authors say that clear juice by double sulphitation process cooled to 15°C was fed into the mixed bed column. I think that when these trials were conducted sulphur was available in plenty and the clear juice which was then obtained might be different from what will now be available when the juices are underlimed and undersulphited and even defecated juices will be there. I would like to know if the authors have studied the juices with the present aspects in view and how much difference they have found in the quality of the juices taken at that time and whatever is available now.
Secondly on page 192, the authors say that 18 tons/day sulphuric acid would be required for a sugar factory of 2000 tons capacity. Possibilities of getting ample sulphuric acid and the resins which are imported from foreign countries must be thoroughly looked into by the authors before the process could be recommended, for adoption to the industry.

Dr. S. K. Ghosh

Regarding the effect of the juices which have to be under limed because of shortage of sulphur we have found that from the point of Ion exchange resin capacity the defecated and under limed juices behave much better because the ionic content in the under limed juices is much less. The only difficulty that comes up is the colloidal matter which is present in the defecated or under limed juice and tends to choke up the passages in the resin bed and the pores of resin particles. Once we tried with the raw juice and we could process some quantity of the juice but it was found that resin bed was getting choked up. With the colloids present in the under limed juices, it is felt that there would not be any difference in the clarity of the juice.

Regarding the requirement of huge quantities of sulphuric acid it sounds very queer that we should be suggesting a process in which sulphuric acid is required in such large quantities when we are suggesting in the same breath ways and means for economising sulphur at other places in the process. We are fully conscious of this paradox and are striving how to solve this problem which has come up to acute foreign exchange difficulty. Things are however not so hopeless as is appearing now. Indian resources of pyrites being quite substantial and since this process requires sulphuric acid and not sulphur this limitation is not going to be very great. Further, a closed cycle system can be thought of in which sulphur can be recovered from the regenerant effluent ingredients and only make up sulphuric acid from the external source supplied.

Regarding resins, strong cation resins are being manufactured in India, so there should be no apprehension about its import from foreign countries. Regarding manufacture of anion resins, some foreign firms are already exploring opportunities for starting its manufacture in India.

Article "A plea for use of Instol for lowering the Viscosity of Low Grade Massecuites" by S. C. Gupta, N. A. Ramaiah and J. P. Bansal (Ref. 34th proc. pp. 231-235).

Dr. N. A. Ramaiah introduced the paper.

Mr. R. N. Agarwal (Saharanpur)

We tried ‘Cutol’ in a sugar factory but could not get any difference in cusing, purging or exhaustion of molasses in comparison to low grade massecuites without cutol. I would now request the factories to try ‘instol’, and try the experiments at different places.

Secondly on page 234 under the table 1, it is mentioned that purity drop of the massecuite with instol is less than that without instol but the final purity of the molasses of the former is more than the latter, I would request the authors to explain this.

Mr. D. R. Parasbar (SKG)

I would like to know whether the action of ‘instol’ is perceptible during the
boiling of the pan or in the crystalliser. From the data given on page 237 it is observed that there is no appreciable change in the purity of the final molasses with instol the purities of C massecuites being practically identical in both the cases.

Further it is observed that the purity of C light has decreased and the purity of final molasses gone up which shows that the circulation of molasses has not decreased considerably so as to give an increase to purity of final sugar by 4 to 5 units. I would like to know its reason from the authors.

Secondly the cooling temperature of the massecuite in the crystalliser as reported have come down to 47 from 50°C. I would like the authors to enlighten if ‘instol’ is responsible in bringing down the temperature.

Mr. C. Chandrasekaran (Kothari)

Observed that from the experiments conducted in our factory, on the use of ‘instol’ showed the following:

1. Viscosity of the C massecuite decreased.
2. The purging rate improved.
3. The flow rate also improved.
4. Quality of C sugar was better.

As the trial was of a very short duration as such definite conclusions could not be reached. We however found instol very useful in our factory.

Dr. N. A. Ramaiah

‘Instol is used only with a view to decrease the viscosity of the C massecuite or reduce the surface tension on the surface crystals with ease. It is not possible for one to expect a decrease in the purity of final molasses by use of Instol for a day or two. What the authors found was that the purity of the single cured C sugar increased by about 3 to 6 unit. The observation suggests that in accord with theoretical consideration, the removal of molasses film surrounding the crystal is efficient. This reduces the recirculation of molasses in the house. one could theoretically expect that by continuous use of Instol and by continuous elimination of recirculation of molasses, we may expect better exhaustion. Due to obvious reasons, the Institute cannot make the trials in a factory for a long time. Further, the deviations pointed out by Mr. Parashar refer to the limitations in the maintenance of constant conditions for Instol experiments and for blank experiments.

Dr. S. K. D. Agarwal introduced the paper.

Mr. B. L. Mittal (Bareilly)

The authors on page 237 write that ‘In recent years the khandarsi industry is under process of modernisation and development, for production of good quality khandarsi sugar is comparable with that of plantation white sugars, majority of the khandarsi factories employ single sulphitation process of clarification of cane juice. By this improved method of clarification, khandarsi factories are producing sugar corresponding to ISS grade 30.'
The vacuum pans factories which follow double sulphitation process find it difficult to produce ISS 30 sugar when vacuum goes down. I would like to know from the authors as to what are factors which help the khandasari factories to manufacture ISS 30 grade sugars even when they are using only sulphitation process and do not make use of vacuum.

Mr. S. C. Gupta (NSI)

There is one reason why good sugar can be obtained from khandasari because this is first grade sugar only. In vacuum pan factories as only good quality sugars have to be produced therefore the low grade sugars have to be reprocessed whereas in a khandasari factories different grades of sugars are bagged separately.


Dr. S. K. D. Agarwal introduced the paper.

Mr. D. R. Parashar

The observations reported by the authors are not in agreement with what are observed in practice. The authors say that the core of the crystals is of high purity and impurities gradually increase with the development of the nuclei crystal whereas actual observations are contrary. In this connection the authors have mentioned that the presence of phosphates or sulphites is necessary for inhibition of destruction of reducing sugars for the formation of colours. In this process if by merely washing of the raw sugars, sugar of 29 or 30 ISS grade could be manufactured, this process has to be considered from this aspect whether some sulphites and phosphates were present in the raw sugars or not and whether the destruction of reducing sugars was reduced by the presence of phosphates or sulphites which might have been used in the process of clarification. I would like the authors to throw light on this aspect and further to enlighten whether meltings were used or not. If by the use of phosphates the colour of the sugar could be improved I do not think it of any use to adopt any costly processes of meltings.

Dr. N. A. Ramaiah

The factories which are deficient of phosphate content in the juices do use phosphate in the north but others do not use. But in the south, it is an essential factor to use phosphate. Some of the observations referred to on page 268, have phosphate as one of the clarifying agents. None of the raw sugars samples were manufactured by the addition of phosphates. On the basis of work done at this Institute it can be said that the quality of seed controls largely the quality of sugar. The colouring matter at the nucleus will not be retained for ever as some observations of Mr. Gundu Rao at Ravalgaon indicate clearly that crystal undergoes self purification.

Mr. S. N Gundu Rao (BIC)

Regarding diffusion of the colour from inside the crystal lattice to outside and from outside to inside, at Ravalgaon we took a candy crystal, boiled in caramel and diffused it out in a few sugar solutions. Similarly at Ravalgaon we used to make tandy crystals, regular crystals in a rotary crystalliser with colour centres. We used to
make open pan candy, big crystal, break them in fine bits. These bits used to be blue, green, red, etc. These irregular bits of crystals we used to put into a rotary crystalliser and boil it on pure melt. Some colour, apart from the surface, used to diffuse out from the nucleus and diffusion was corresponding to the rate of crystallisation. But still some portion of the colour used to remain in the central portion of the nuclei because the rate of crystallisation and layer development out grew the rate of diffusion and blocked the diffusion part. The result was that we used to have varied type of crystals sufficiently big with fine nucleus centres of the various colours which shows that colour from the central nucleus is not completely diffused out.

Dr. S. K. D. Agarwal

The colour adhering to the surface of the raw sugar crystals after washing equals to more or less ISS 29 grade sugar and we never claim that the colour of the core of raw sugar will be exactly the same as that of white sugar. By assuming total colour of raw sugar as 1, if 1/7th of this sugar is dissolved, it has been proved that 1/3 of the colour is removed. In DMC II process instead of taking saturated syrup for dissolution it was made into the form of a magma which means part of the crystal has been washed and by dissolving the part of the crystal some of the colour that is adhering in addition to the molasses film on the crystal will be dissolved.

Regarding the total colour of the sol.

of the core of the crystal is concerned it is never suggested that it will be of the same order as of the white sugar.

Article "Preventive maintenance for Sugar Industry" by V. B. Singh (Ref. 34th Proc. 1966 pp 273-275).

Mr. V. B. Singh introduced the paper.

Mr. H. A. Shah (Mawana)

Mr. Shah informed about the creation of a Preventive Maintenance section in his factory and hoped that with the creation of the above section the chances of break downs in his factory will be comparatively less. The assignments of the maintenance section mentioned by Mr. Shah are the following:

1. Charts for the different machinery to find out whether the machinery is working alright and if not where is the trouble.
2. Lubrication of the machinery: Proper lubrication and frequency of its application is very necessary for minimising break downs.
3. History sheets of the machinery is maintained.
   Preparing schedule: This is done with a view to changing packing, bushes or bearing at the proper time.
4. History of the break downs: When a major break down occurs this section has to study the cause of the break down, whether it was due to defective operation, maintenance or what.
5. Training of the workmen.
6. Cleaning.

Mr. G. R. Athawale, Mr. A. L. Bhatia, Mr. R. L. Junjia, endorsed that the preventive maintenance is very necessary in reducing break downs in the sugar factories.

Dr. N. A. Ramaiah introduced the paper

Mr. D. R. Parashar

There are some statements in the paper which do not agree with each other. On page 217 it is mentioned "It is of interest to note that whatever may be the size of the crystal a known quantity of sugar gave the same amount of colour in solution phase despite a marked difference in their appearance". Further the authors on page 218 say "the reflectance colour value increases with decrease in the crystal size". On page 218 again the authors write "In the case of substances like sugar in which the impure colouring matter is present, the magnitude of the reflectance value is complicated by the combined influence of lustre and colour". If the lustre and colour are complicating the whole issue then how the values have been determined and what is the modulated reflectance value in relation to lustre and colour.

Dr. N. A. Ramaiah

Colour in solution and colour in the solid state these are two different aspects and connected together by the impure constituent namely the colouring matter. Colour in solution gives total amount of colour present in the sugar crystal and colour in solid state as it appears to the naked eye gives primarily colour content distributed per unit area of the surface. By taking a known quantity of sugar from the same massesuite, the observations indicated that the colour content in the solution phase was the same and therefore the measurement of the colour in the solution phase could not be applied for making a standard method for the measurement of colour in the plantation white sugar.

The second point about the reflectance increases as the grain size decreases, this can be followed with simple case from the theoretical considerations. If 1 gm. of the impure colouring matter is distributed over a larger surface area, the colour content per unit area would be less.

Regarding difference in modulated reflectance and simple reflectance value as observed on a colorimeter gives a factor controlling two aspects (i) lustre and (ii) the actual colour. In the modulated case, a correction factor is given for the lustre and obtain only that reflectance value which controls only the colour.
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