# MIXED JUICE SCREENING IN TWO STAGES AT MILL HOUSE

Chaitanya S. Joshi Suviron Equipments Pvt. Ltd, G-120, MIDC, Ahmednagar, India 414111 Email: <u>contact@suviron.com</u> Mobile:- +91 9158898906

# Abstract:

To achieve maximum sugar extraction at mills we have to increase PI to the maximum extent possible. This resulted into higher fine bagacillo particles in mixed juice from mills. A single stage screening system with rotary juice screen having wedge bar opening of 0.5mm is now not sufficient to handle these fine particles and hence further screening of the screened mixed juice is very important. A similar construction rotary juice screen having 0.35mm wedge bar opening is used to screen the screened mixed juice resulted from 0.5mm opening rotary juice screen.

In this paper we have highlighted the installation, operation, data collection, advantages and cost economics of this technology.

# Keywords:

Unscreened mixed juice, screened mixed juice, rotary juice screen, fibre

# Methods:

Fibre content of juice - ICUMSA GS7-13 (1994)

# Introduction:

Over a period of last few crushing seasons many sugar factories reported the problem of higher quantity of fine bagacillo particles in screened mixed juice.

For sugar industry stage wise operation is not a new concept. It is required to achieve maximum results. For example to achieve maximum sugar extraction at milling station 4 to 6 mills are required and another example is of pan boiling where stage wise A, B and C massecuite pan boiling is carried out to separate maximum sugar from mother liquor. In the similar lines to minimize the problem of higher quantity of fine bagacillo particles in screened mixed juice it is now important that the juice screening is to be carried out in two stages i.e. initially "coarse separation" followed by "fine separation".

# Data collection:

Over a period of last 17 years following data was collected which indicates increase in the quantity of fine bagacillo particles in screened mixed juice.

Period	Fibre content in screened mixed juice (g/l)
2000-2004	1.35 – 1.5
2005-2009	1.5 – 1.65
2010-2017	1.7 – 2.2

# Remedial actions taken at existing screen in mill house:

Various tests were carried out on the existing rotary screen having 0.5mm opening in order to reduce fine bagacillo particles in screened mixed juice. Those tests are listed as below

- 1. Change in rpm of the drum
- 2. Different wedge bar opening in the same screen
- 3. Inclination of screen drum
- 4. Change in direction of screen rotation

The result obtained was not encouraging as there is no much difference in bacacillo content of screened mixed juice.

# Details of juice screening in two stages at mill house:

Therefore our aim is to carry out juice screening in two stages i.e. unscreened mixed juice from mills will be screened with rotary juice screen having wedge bar opening of 0.5mm and the screened mixed juice from this screen will be screened with rotary juice screen having wedge bar opening of 0.35mm. Depending upon mill house layout and head room availability second stage juice screening is to be carried out preferably by gravity flow to eliminate additional pumping of juice.

# 1<sup>st</sup> Stage Rotary Juice Screen: Used as coarse separation:

This screen is already exists at milling tandem. The unscreened mixed juice from mills is pumped to this screen fitted with 0.5mm wedge bar opening. The bacacillo separated from this screen is discharged into carrier and screened mixed juice is diverted towards  $2^{nd}$  stage rotary juice screen.

# 2<sup>nd</sup>Stage Rotary Juice Screen:

This screen is newly added at milling tandem as near as possible to existing 1<sup>st</sup> stage rotary screen. This screen is fitted with 0.35mm wedge bar opening screen drum. The screened mixed juice from 2<sup>nd</sup> stage rotary screen is delivered in screened mixed juice tank and pumped for further processing. The additional bacacillo separated is also discharged into the carrier. As the opening is less 2<sup>nd</sup> stage rotary screen requires washing at higher frequency than that of 1<sup>st</sup> stage screen and hence 2<sup>nd</sup> stage rotary juice screen is provided with high head washing pump and special feature i.e. wash water collection gutter. The water required for screen washing is collected in this collection gutter and is used for imbibition.

Table No.	1:	Data	colle	ction	at	various	insta	llations.
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Average of data collected at juice screening in two stages at various installations					
Sr. No.	Particulars	Shiraguppi	Gangamai	Harinagar	Average
А	Fibre in unscreend mixed juice from mills	8.09 g/l. (0.809 %)	7.33 g/l. (0.733 %)	7.81 g/l. (0.781 %)	7.74 g/l. (0.774 %)
В	Fibre in screened mixed juice afer 1 <sup>st</sup> stage Rotary Juice Screen (0.5 mm opening)	1.77 g/l. (0.177 %)	1.37 g/l. (0.137 %)	1.6 g/l. (0.16 %)	1.58 g/l. (0.158 %)
С	Fibre in screened mixed juice after 2 <sup>nd</sup> stage Rotary Juice Screen (0.35 mm opening)	0.69 g/l. (0.069 %)	0.67 g/l. (0.067 %)	0.76 g/l. (0.076 %)	0.71 g/l. (0.071 %)
D	Fibre separated at 1 <sup>st</sup> stage Rotary juice screen (A-B)	0.632 %	0.596 %	0.621 %	0.616 %
Е	Fibre separated at 2 <sup>nd</sup> stage Rotary juice screen (B-C)	0.108 %	0.070 %	0.084 %	0.087 %
F	Total fibre separated across two stages of Rotary juice screens (A-C)	0.740 %	0.666 %	0.705 %	0.703 %
G	Fibre seperation efficiency (F/A) X 100	91.47 %	90.86 %	90.27 %	90.83 %

# Table No. 2:- List of installations

Sr.	Name of sugar factory	State	No. of RJS.	Year
01	The Krishna SSK Niyamit, Athani	Karnataka	1	2012-13
02	Shiraguppi Sugar Works Limited	Karnataka	1	2014-15
03	Gangakhed Sugar & Energy Limited	Maharashtra	2	2015-16
04	Nirani Sugars Ltd. Mudhol	Karnataka	4	2015-16
05	Athani Sugars Limited	Karnataka	1	2015-16
06	Gangamai Industries and Constructions Ltd.	Maharashtra	1	2016-17
07	Baramati Agro Limited	Maharashtra	2	2016-17
08	Shri Balaji Sugars and Chemicals Pvt. Ltd.	Karnataka	1	2016-17
09	Vishwaraj Sugar Industries Ltd.	Karnataka	2	2016-17
10	Harinagar Sugar Mills Ltd.	Bihar	2	2016-17
11	ISGEC - Gokul Mauli Sugar Ltd.	Maharashtra	1	2017-18
12	Jaywant Sugars Ltd.	Maharashtra	1	2017-18
13	Meru Industries - M/s. Pure Diet Project	Uttar Pradesh	1	2017-18
14	Shree Siddheshwar SSK Ltd.	Maharashtra	2	2017-18
15	Venkateshkrupa Sugar Mills Ltd.	Maharashtra	1	2017-18

# Table No. 3 **Cost economics of 2<sup>nd</sup> stage rotary juice screen**

Forever financial gain by using additional bagasse based on Table No. 1						
Bas	Base					
1.	Total Annual cane crushing	10 lac tons				
2.	Unit rate of bagasse	Rs. 2500/- per ton				
Calculations						
1.	Residual fibre content in screened mixed juice at 1 <sup>st</sup> stage Rotary Juice Screen having 0.5 mm opening.	0.158% mixed juice on oven dry basis (B of table no. 1)				
2.	Residual fibre content in screened mixed juice at 2 <sup>nd</sup> stage Rotary juice Screen having 0.35 mm opening.	0.071 % mixed juice on oven dry basis (C of table no. 1)				
3.	The reduction in residual fibre content in mixed juice	0.087 % mixed juice on oven dry basis (E of table no. 1)				
4.	For the sake of simplicity of calculations let us consider mixed juice % cane as,	100				
5.	Hence the reduction of fibre content % cane	0.087% cane on oven dry basis				
6.	Let us consider fibre % mill bagasse as	50%				
7.	Additional mill bagasse % cane	0.174 % cane				
8.	Quantity of additional mill bagasse	0.174 x 10,00,000 / 100 1740 Ton				
9.	Forever financial gain	1740 x 2500 Rs. 43,50,000				
	Forever recurring gain every season	Rs.43.50 Lacs				





# Figure No. 2

2-Stage Rotary Juice Screening system at 5000 T.C.D. Sugar factory



# Advantages:

- 1. Additional bagasse is available for co-gen power plant.
- 2. Reduction in new colour forming compounds.
- 3. Reduction of floating particles in clear juice.
- 4. Chocking at pumps, juice heater headers, tubes and PHE etc is decreased.
- 5. Solid load on juice clarifier is reduced.
- 6. Payback period is less than two seasons.

# Conclusion:

Total bagacillo separation from unscreened mixed juice to second stage screened mixed juice is achieved around 90%. This bagacillo reduction helped to reduce bagacillo loading on clarification house and improve the overall performance of entire process house.

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