SCREENING OF JUICES THROUGH ROTARY AND DSM SCREEN

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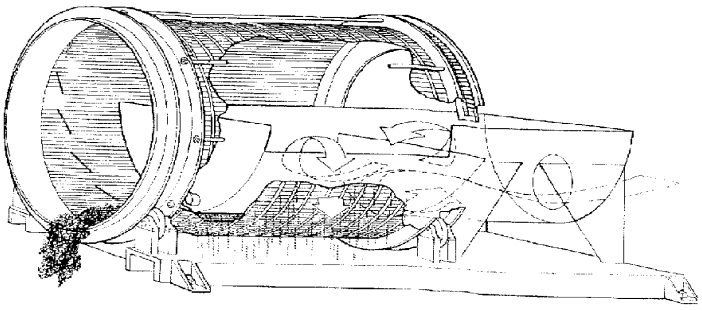
ABSTRACT

During the year 2008, DSM screen having slot size 0.7mm installed at mill house for screening of mixed juice and DSM screen with slot size 0.35mm working for screening of clear juice were replaced by two rotary screens of 0.5mm slot size for mixed juice and 0.2mm slot size for clear juice. after initial operational difficulties both the screens worked satisfactorily, not only clarity of clear juice increased but bagacillo particle in juices decreased which resulted less scale formation in juice heaters, evaporator tubes and back liner of continuous centrifugal. Also, e-circulation/ overflow of juice at the 2 mills was considerably reduced, resulting in improved mill working.

INTRODUCTION

Sanghar sugar mills ltd, was established in the year 1987-88. It is a Five Cail Babcock (FCB) designed plant. the original plant capacity was 3000 TCD (Tonnes crushing per day). which was later on enhanced to 4500 TCD and 5400 TCD in two phases. Right from the start of the first crushing season DSM screen of 0.7mm slot size was installed at mill house for screening of mixed juice and 0.35 mm slot size screen was in use for screening of clear juice. To improve the quality of mixed juice and clear juice, two rotary screens were commissioned at the plant in the year 2008, one for screening of mixed juice at mill house of 0.5mm slot size and the other one for screening of clear juice of 0.2mm slot size (Baikow, 1982). By installation of these two rotary screens a reasonable quantity of bagacillo from mixed juice and clear juice removed if compared with DSM screen performance, re-circulation / overflow of juice from mill no. 02 almost eliminated which resulted in improving of mills working i.e. reduction in bagasse pol, better mill extraction, clarity of juice increased, viscosity in massecuites minimized, color of sugars improved, less scale at juice heaters and evaporator tubes observed, thereby increasing tube cleaning period of both these vessels, during season.



Important feature of Rotary Screen

Both the rotary screens are of 3600mm length and 1800mm diameter (inner). The drum itself is inclined at an angle of about 5 degree for easy discharge of screened solids. The screen drum is driven by a heavy-duty chain and rotated by trunnions with a taper roller bearing design. Thrust bearings balance the axial load and prevent the drum from slipping. 7.5 kw electric motor is provided to drive the screen drum. Rotational speed of drum is 11 rpm. Both the rotary screens (mill house & boiling house) can handle cane crushing of

8000 TCD. A set of sparge pipes spray water on the outside of the screen drum was provided to keep the screen clean. A juice distribution box is constructed at one end of the drum screen inside it to receive the juice. distribution box is designed in a manner to break the velocity of the juice and spread it evenly on the screen surface. The rotation of the drum screen is counter to the direction of the incoming juice. slot size of the screen installed at mill house is 0.5 mm whereas 0.2 mm size screen is provided at boiling house for screening of clear juice received from juice clarifier. 304 stainless steel is used to make the screen, the frame constructed in mild steel and with epoxy coating (Hugo, 1986).

Difficulties during operation of Rotary Screen

Mill house screen worked very successfully from its start. there was a problem of overflow of juice from mill no.2 and its constant slipping due to excessive load of unscreened juice associated with bagacillo coming from dsm screen on the same mill. this very problem almost solved when rotary screen was put into operation, not only slipping of mill and juice overflow reduced but un necessary juice re-circulation avoided which resulted better mill extraction and reduced bagasse pol as compared to previous cane crushing season. (table 2) Rotary screen (0.2mm) installed for screening of clear juice gave problem of frequent choking of mud particle on the surface of the screen, problem was so severe that sometimes cane crushing rate was reduced or rotary screen had to by passed and DSM screen was taken in line (Naqvi, 1987). In spite of that water applied at the screen after every 10 minutes time through high pressure nozzles regularly, problem of choking remained standstill. Frequently rotary screen had to be stopped and cleaned again and again with water and hydrochloric acid solution but even then, when the screen put into operation it gets choked after 48 hours working only. Problem was discussed with supplier but no fruitful solution was received.

Measures taken to overcome the Problem

It was a matter of great concern that even HCL of high concentration was unable to remove fully choking of mud deposited on the screen. finally, it was decided to try caustic soda solution on the surface of the screen to remove its deposits, instead of HCL. Caustic soda solution proved to be more successful and all the choking eliminated in hours from the screen (Rashid, 2006).

Secondly it was decided to provide some high-pressure nozzles at right side of the screen at a distance of 2" from the drum in full length of the said screen. these nozzles were connected with clear juice pump through 2 diameter size pipelines. These clear juice nozzles were kept open throughout the operation of rotary screen. please refer sketch 1. These arrangements proved very successful and the rotary screen began to work for 7-9 days without creating any hindrance of choking or poor performance. afterwards it was made a routine that after every 7 days working, screen is stopped, caustic soda solution applied on its upper and inner surface thoroughly and left it for 4-6 hours and then washed it with hot water and steam and taken it in line again during stoppage of rotary screen DSM screen was operated (Mathur, 1997). a moving type nozzle was also provided outside the drum screen and connected with high pressure live steam. steam applied on the surface of the screen after every 4 hours through this nozzle during operation of the screen.

RESULTS AND DISCUSSION

Both the rotary screen (mill house + boiling house) worked very efficiently and gave good results during season 2008-2009, 2010-2011. Not only optimum removal of bagacillo from mixed juice and clear juice were observed as compared to DSM screen performance but re-circulation of juice avoided at mill house which resulted better mill extraction and reduction in bagasse pol, clarity of clear juice also increased from 91 to 94 % and above.

Table-1 Shows three years comparison between rotary screen of 0.5mm slot size and DSM screen of 0.7mm slot size and quantity of bagacillo in term of g/liter of mixed juice

Crushing Season	Rotary Screen (0.5mm slot)	DSM Screen (0.7mm slot)
Dec 2008 (Average)	0.40 g/ liter of m.j.	0.81 g/ litre of m.j.
Jan 2009 (Average)	0.45 g/ liter of m.j.	0.60 g/ litre of m.j.
Feb 2009 (Average)	0.50 g/ liter of m.j.	0.70 g/ litre of m.j.
Dec 2009 (Average)	0.55 g/ liter of m.j.	0.65 g/ litre of m.j.
Jan 2010 (Average)	0.56 g/ liter of m.j.	0.68 g/ litre of m.j.
Feb 2010 (Average)	0.49 g/ liter of m.j.	0.80 g/ litre of m.j.
Dec 2010 (Average)	0.45 g/ liter of m.j.	0.80 g/ litre of m.j.
Jan 2011 (Average)	0.52 g/ liter of m.j.	0.78 g/ litre of m.j.
Feb 2011 (Average)	0.48 g/ liter of m.j.	0.76 g/ litre of m.j.
Mar 2011 (Average)	0.48 g/ liter of m.j.	0.76 g/ litre of m.j.

Table-2 Shows improvement in mill extraction and reduction in bagasse pol from cane crushing season 2006-07 to 2010-11

Mill Extraction and POL % Bagasse

Crushing Season	Mill Extraction	POL% Bagasse
2006-07	94.80	1.73
2007-08	94.58	1.96
2008-09	95.10	1.68
2009-10	95.33	1.60
2010-11	95.60	1.47

Table-3 Indicates quantity of bagacillo grams per liter of clear juice in comparison with rotary screen of 0.2mm slot size and DSM screen of 0.35mm slot size

Quantity of Bagacillo in Clear Juice (g/liter)
Rotary Screen Vs DSM Screen

Crushing Season	Rotary Screen (0.2mm slot)	DSM Screen (0.35mm slot)
Dec 2008 (Average)	0.221 g/ liter of cl. juice.	0.32 g/ liter of cl. juice.
Jan 2009 (Average)	0.188 g/ liter of cl. juice.	0.38 g/ liter of cl. juice.
Feb 2009 (Average)	0.190 g/ liter of cl. juice.	0.40 g/ liter of cl. juice.
Dec 2009 (Average)	0.210 g/ liter of cl. juice.	0.39 g/ liter of cl. juice.
Jan 2010 (Average)	0.220 g/ liter of cl. juice.	0.36 g/ liter of cl. juice.
Feb 2010 (Average)	0.188 g/ liter of cl. juice.	0.31 g/ liter of cl. juice.
Dec 2010 (Average)	0.200 g/ liter of cl. juice.	0.31 g/ liter of cl. juice.
Jan 2011 (Average)	0.200 g/ liter of cl. juice.	0.35 g/ liter of cl. juice.
Feb 2011 (Average)	0.180 g/ liter of cl. juice.	0.30 g/ liter of cl. juice.
Mar 2011 (Average)	0.180 g/ liter of cl. juice.	0.36 g/ liter of cl. juice.

Table-4 Shows the clarity of clear juice for six crushing seasons (2005-06 to 2010 - 2011). it is evident from the table that remarkable achievement obtained after installation of rotary screens at the plant

Crushing Season	Clarity of Clear Juice %
2005-06	90.70
2006-07	90.85
2007-08	91.30
2008-09	94.30
2009-10	94.80
2010-11	94.80

Other Benefits Achieved are Appended below

Less bagasse quantity observed in juice heaters, when opened for tube brushing, tube cleaning schedule of the juice heaters which was previously 5 days increased to 8 days.

Due to removal of fine particles from clear juice, tube cleaning schedule of last evaporators also increased from 7 to 10 days.

Vapor cell is to be shut after every 20 days for tube cleaning, easily operated for 25 days and more.

No bagacillo or mud particles were seen in syrup during graining at pans and less viscosity observed in syrup, molasses and massecuite.

Before installation of rotary screen back liner of all continuous centrifugal had to clean of mud choking after every 10-15 days, this time increased considerably up to 25-30 days.

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