EFFECT OF 2nd STAGE ROTARY JUICE SCREEN ON CAPACITY ENHANCEMENT OF EXISTING DECANTER STATION WITH ENERGY CONSERVATION

Rajendra Dongare[1], Balkrishna Gitte[2], Anilkumar Lobhe[3]

Abstract:
The capacity and performance of decanter machine is normally judged and dictated more specifically by the 'insoluble solids' it has to handle and also simultaneously although to a lesser extent by the 'liquid' loading.

Once the importance of this fundamental principle of decanter application was well understood full scale work was taken up on how effectively to reduce the 'insoluble solids' contents of decanter feed i.e. muddy juice underflow of juice clarifier.

With the help of proto type skid mounted Rotary Juice Screen fitted with 0.35 mm wedge bar opening as provided by Suviron Equipments Pvt.Ltd. we conducted series of field trials at our sugar factory to find out potential of further reduction in fibre solids contents of screened mixed juice as resulting from existing Suviron Equipments Pvt.Ltd., supplied Rotary Juice Screen having 0.5 mm wedge bar opening.

Encouraged by this field trials we installed Rotary Juice Screens; one no. 'new' having 1800 mm dia. X 4000 mm length and for existing one no. of similar size Rotary Juice Screen only screen drums were replaced i.e. both having 0.35 mm wedge bar opening, which is suitable to handle 10000 TCD crushing capacity together to work as 2nd stage screening. This 2nd stage Rotary Juice Screening system operates on gravity flow principle. Hence double pumping of mixed juice is totally is avoided.

Subsequent to two stage operation of Rotary Juice Screens during current season the fibre solid content of mixed juice going to process is effectively reduced from 0.14 - 0.17% to 0.05 - 0.06% i.e. reduction by 65% !

This discussion relates to advantages of such prescreening on the operation of existing decanter station.

Key word:
Decanter, juice clarifier underflow muddy juice, two stage Rotary Juice Screening system.

---

1. Chief Executive Officer, 2. Chief Engineer, 3. Chief Chemist
Gangakhed Sugar And Energy Limited, Gangakhed

Analytical method used for data collection:

Method GS7 – 7	The Determination of the Pol content of Filter cake and Reject Cake
Method GS7 – 9	The Determination of Moisture content of filter cake and Reject cake by Oven Drying
Method GS7 – 11	The Determination of the mud solids in juice, clarifier underflow muddy juice, Filter cake and Reject cake by Gravimetric method
Method GS7 – 13 (1994)	The Determination of the mud solids in juice, clarifier underflow muddy juice, Filter cake and Reject cake by filtration method

Introduction:

Right from conceptual stage of a new 6000 TCD greenfield sugar complex having 30 MW cogeneration plant and 60 KLPD distillery at Gangakhed Sugar and Energy Ltd., it was decided to apply most modern and latest technologies at all stations. One such i.e. 'decanter system' was preferred and installed instead of obsolete Rotary Vacuum Filter technology. The plant was commissioned in the year 2009-10. During the new plant set up Suviron Equipments Pvt.Ltd., supplied entire decanter system with 4 nos. decanter machines (2 nos. for 1st stage operation, 2 nos. for 2nd stage operation). The repeat performance as observed since the commissioning has undoubted proved and technically justified this modern technology as a best alternative to Rotary Vacuum Filter technology.

During the current crushing season 2015-16 factory carried out plant expansion in existing plant to achieve the crushing capacity upto 7500 TCD as phase-I program.

In order to meet with requirement of enhanced plant capacity factory has expanded the decanter system by upgrading the existing units of decanter system and added two nos. decanter machines.

However, subsequent to installation of 2nd stage Rotary Juice Screening system and due to substantial reduction of insoluble / suspended solid loading on decanter, it is found that the old system having 2+2 combination is sufficient to handle the expanded plant capacity of 7500 TCD plus without requiring the operation of provided two nos. added decanter machines.

Description of two stage Rotary Juice Screening System

System operation:

The 1st stage Rotary Juice Screen will receive unscreened mixed juice from mills. The screened mixed juice resulting from this 1st stage ("coarse" separation) Rotary Juice Screen shall be fed by gravity in required proportion to two nos. 2nd stage ("fine" separation) Rotary Juice Screens for fine separation. The final screened juice resulting out from two nos. Rotary Juice Screens at 2nd stage shall be pumped to juice clarification section.

Rotary juice screen set up to suit 10,000 TCD crushing.
1st Stage ("coarse" separation):
1) One no. 2400 mm diameter x 5400 mm length having 0.5mm wedge bar opening.

2nd stage ("fine" separation):
1) One no. 1800 mm diameter x 4000 mm length having 0.35mm wedge bar opening.
2) One no. 1800 mm diameter x 4000 mm length having 0.35mm wedge bar opening.

A) Details of existing rotary juice screens and re-utilization of the same for the two stage screening system:

A-1 One no. rotary juice screen - **new** in all respect 2400mm diameter x 5400 mm length having 0.5mm wedge bar opening.
This screen is used as **1st Stage ("coarse" separation)** screening.

A-2 One no. existing rotary juice screen having 1800mm diameter x 4000 mm length having 0.5mm wedge bar opening.
This screen is used for **2nd stage ("fine" separation)** screening after carrying out required modifications in respect of juice feeding arrangement and also by replacing the screen drums now fitted with 0.35 mm wedge bar opening screen.

A-3 One no. rotary juice screen - **new** in all respect 1800mm diameter x 4000 mm length having 0.35mm wedge bar opening.
This screen is used as **2nd stage ("fine" separation)** screening.

I) Detailed technical specification of Rotary Juice Screen having 2400 mm diameter x 5400 mm length to be used for **1st Stage ("coarse" separation):**

Particulars	Data
Quantity per tandem	01 no.
Screen drum diameter	2400 mm
Welded wedge bar screen drum length	5400 mm
Wedge bar opening	0.5 mm (with standard tolerance)
Screening area	40.71 sq. mtr.
Drive System	15 kW VFD application
	1440 rpm TEFC sq. cage S1 continuous duty electric motor with planetary type gear box and power transmission by heavy duty simplex chain and drive/driven sprockets, **to achieve final linear speed of screen drum <1 mtr./sec.**

II) Detailed technical specification of Rotary Juice Screen having 1800 mm diameter x 4000 mm length to be used for **2nd stage ("fine" separation):**

Particulars	Data
Quantity per tandem	02 nos.
Screen drum diameter	1800 mm
Welded wedge bar screen drum length	4000 mm
Wedge bar opening	0.35 mm (with standard tolerance)
Screening area	22.62 sq. mtr.
Drive System	7.5 kW VFD application
	1440 rpm TEFC sq. cage S1 continuous duty electric motor with planetary type gear box and power transmission by heavy duty simplex chain and drive/driven sprockets, **to achieve final linear speed of screen drum <1 mtr./sec.**

Results and discussion

A) Fibre analysis

a) Fibre content of screened juice at the outlet of 1st stage RJS= 0.14 to 0.17%
b) Fibre content of screened juice at the outlet of 2nd stage RJS= 0.05 to 0.06%

B) Total insoluble solids analysis

Total insoluble solids content of mixed juice going to process

a) Before installation of 2nd stage RJS = 0.65 to 0.70%
b) After installation of 2nd stage RJS = 0.50 TO 0.55%

C) Clarifier underflow muddy juice % cane

a) Before installation of 2nd stage RJS = 8 to 9%
b) After installation of 2nd stage RJS = 5.5 to 6.5%

D) Reject cake % cane

a) Before installation of 2nd stage RJS = 2.0%
b) After installation of 2nd stage RJS = 1.4%

E) Power consumption at decanter station

a) Before installation of 2nd stage RJS = 0.55 kW/tch
b) After installation of 2nd stage RJS = 0.35 kW/tch

The normally industry accepted average power consumption at RVF station is 0.65 to 0.7 kW/tch

Interpretation of above analytical results and effect on decanter operation :

Subsequent to installation of 2nd stage Rotary Juice Screen substantial reduction of fibre content and total insoluble solid content in mixed juice going to process is observed. This has ultimately resulted into further reduction of muddy juice % cane and reject cake % cane.

CONCLUSION

Instead of 3+3 decanter combination which was planned for expanded plant capacity it is observed that only 2+2 combination of decanters is more than adequate. This has resulted into substantial saving on account of total power consumption at decanter station. Hence it is safely concluded that by prescreening arrangement for mixed juice the capacity of existing decanter station is increased in proportion to reduction in insoluble solid loading on decanter.

ACKNOWLEDGEMENT

Authors express their grateful thanks to management of M/s. Gangakhed Sugars & Energy Limited for their kind permission to publish this paper. Authors are also thankful to Suviron Equipments Pvt. Ltd., for successfully commissioning and for assistance extended to operate the two stage Rotary Juice Screening system and decanter system.

REFERENCES

1. Subodh Vinayak Joshi (2014) - Interpretation of data collected at Decanter station of five sugar factories – STAI Convention 2014.
2. Ankush J. Jagadale and J. A. Chavan (2014) - Studies on fully automatic decanter at Shri Chhatrapati Shahu SSK Ltd., Kagal – DSTA Convention 2014.