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गन्ने रस की छलनी — विशिष्टि

Draft Indian Standard

SUGAR CANE JUICE SCREENS — SPECIFICATION

ICS No 67.180.10

Sugar Industry Sectional Committee, FAD 02 Last date of comments : 29/01/2025

FOREWORD

(*Formal clause will be added later*)

Screening sugar cane juice is the process of removing solid impurities, such as cane fibers (cush-cush), dirt, and other particulate matter, from the extracted juice before it undergoes further processing. This is a crucial step in the sugar manufacturing process, ensuring the juice is clean and suitable for subsequent stages like clarification, evaporation, and crystallization.

Various types of juice screens are used for screening of sugarcane juice. Such juice screens are being manufactured by different suppliers based on their requirements. Therefore, a need was felt to develop a standard on sugar juice screens to assure the quality and performance of the machinery manufactured and used in sugar factories.

For the purpose of deciding whether a particular requirement of the standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (second revision)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Draft Indian Standard

SUGAR CANE JUICE SCREENS — SPECIFICATION

1 SCOPE

This standard specifies material, constructional, cleaning and performance requirements of the sugarcane juice screens.

2 REFERENCES

The standards listed below contain provisions which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent edition of these standards.

IS No.	*Title*
IS 808: 2021	Hot Rolled Steel Beam, Column, Channel and Angle Sections — Dimensions and Properties (*fourth revision*)
IS 2062: 2011	Hot rolled medium and high tensile structural steel — Specification (*seventh revision*)
IS 2403 : 2024/ ISO 606	Short-Pitch Transmission Precision Roller and Bush Chains, Attachments and Associated Chain Sprockets (*fourth revision*)
IS/ISO 5199 : 2002	Technical specifications for centrifugal pumps — Class II
IS 6911 : 2017	Stainless steel plate, sheet and strip — Specification (*second revision*)
IS 7226 : 1974	Specification for cold-rolled medium, high carbon and low alloy steel strip for general engineering purposes
IS 9595 : 1996	Metal - Arc welding of carbon and carbon manganese steels — Recommendations (*fifth revision*)
IS 15999 (Part 1) : 2021	Rotating Electrical Machines — Part 1 Rating and Performance (*second revision*)
IS 16003 : 2022	Specification and qualification of welding procedures for metallic materials General rules (*first revision*)

3 TERMINOLOGY

3.1 Rotary screen drum

Screen with end drum assembly for separation of cush-cush.

3.2 Stationary juice-wetted parts of screen

The parts of juice screen which are in contact of juice.

3.3 Area of the screen

Calculated by π*diameter*length.

3.4 First stage of screening

Screening of the raw sugarcane juice for coarse cush-cush separation.

3.5 Second stage of screening

Screening of first stage juice for the fine cush-cush separation.

3.6 TCD

Tonnes cane crushing per day.

3.7 TCH

Tonnes cane crushing per hour.

4 MATERIAL REQUIREMENTS

4.1 The materials of various parts of the juice screens shall be as given in column 3 of Table 1. The material shall conform to the relevant Indian Standard as given in column 4 of Table 1.

Table 1 Materials for various parts of sugarcane juice screens
(Clause 4.1)

S.No.	Name of Part	Material and grade	Reference to Standard
(1)	(2)	(3)	(4)
1	Screens with end drums	Stainless steel X04Cr19Ni9 (304 S1)	IS 6911
2	Stationary juice wetted parts	Stainless steel X 02CrI2 (ISS 409M)	IS 6911
3	Base frame structure for screen	Medium tensile structural steel E250	IS 2062
4	Open sprockets for drive	High carbon alloy steel C80	IS 7226
5	Guide and thrust wheel	Metlon	-
6	Three phase induction motors	IP 55	IS 15999 (Part 1)
7	Roller chain (simplex) for drive	-	IS 2403
8	Centrifugal pump	-	IS/ISO 5199

5 CONSTRUCTIONAL REQUIREMENTS

5.1 Frame

The main frame shall be fabricated with Indian Standard Medium Channel (ISMC) and Indian Standard Angle (ISA) sections as per IS 808. The frame shall be covered wherever required

with mild steel sheet of adequate thickness, not less than 3.0 mm, depending on the requirement.

5.2 Rotary screen drum

One or multiple welded wedge bar rotary screen drum depending on the capacity shall be used. The size of the rotary screen drum depends upon the plant cane crushing capacity in TCD or TCH. On the basis of design size, diameter and length rotary screen drum should be selected. The speed and inclination of the rotary screen drum should be according to the design criteria; however, linear speed of the rotary screen drum shall be less than 1 meter/second.

5.3 The drive of the rotary screen drum shall be electric drive consisting of 3 phase induction motor with reduction planetary gear-box and open sprocket.

5.4 Area of juice screen

The area of the screen should be according to the crushing capacity of the factory. The recommended area required for first stage of screening is 220-275 TCD /m^2 and for the second stage of screening is 150-180 TCD/m^2.

5.5 Inclination of the screen

It should be 1.5^0 from the horizontal for first stage screening and 0.5^0 for second stage screening.

5.6 Aperture size of wedge bar screen

5.6.1 For construction of rotary juice screen, wedge bar screens should be used. These should be of standard size and opening in the shape of wedge. The range of wedge bar opening should be 0.35-0.50 mm.

5.6.2 For the two stage operation of rotary juice screen, the first stage screened mixed juice should be delivered to second stage rotary juice screen as far as possible by gravity flow according to mill house layout and other factors like available head etc.

5.6.3 For screening first stage raw juice, the size of wedge wire should be 0.45-0.50 mm. For screening of second stage mixed juice, the size of wedge wire opening should be 0.35 mm.

5.6.4 For screening of refinery melt, the screen aperture size may be 0.25 mm to 0.45 mm.

Note- The tolerance of wedge bar opening should be +/- 0.02 mm.

5.7 Welding work during fabrication

During the fabrication of rotary juice screen, Tungsten Inert Gas (TIG) welding technique as per IS 16003 should be used for stainless steel parts and the internal structure. For the outer structure, arc welding technique as per IS 9595 should be used.

5.8 The rotary screen shall have platform, ladder and railing for safety point of views as a part of staging structure for installation of rotary juice screen.

6 PERFORMANCE REQUIREMENTS

6.1 The rotary juice screen shall be operated at no load. During the no load, visual inspection shall not show following abnormalities.

(a) No vibration in rotary screen and its structure.
(b) No any other abnormal sound.
(c) No marked rise in temperature in rotating parts.
(d) No marked wear and tear.

6.2 Juice flow in screen shall be free flow, there should not be any obstruction in juice flow of the screen.

6.3 Cush-cush content of juice shall be tested as per Annex A and shall meet the following requirements

(a) Quantity of cush-cush in screened first stage rotary juice screen shall be 2.0 to 2.5 grams/kg on dry basis.
(b) Quantity of cush-cush in screened second stage rotary juice screen shall be 0.8 to 1.0 grams/kg on dry basis.

7 JUICE SCREEN CLEANING

7.1 Cleaning of screen shall be done to avoid jamming of the screen. For the cleaning of juice screen, a pump should be used. The pump should be capable to generated pressure up to 5-6 kg/cm^2.

7.2 The cleaning of the rotary juice screen shall be done as follows

(a) The juice screen shall be cleaned by using measured hot water having a temperature of 70-75 ^0C.
(b) The frequency of operation shall be 1-2 minutes in every time interval of 10-20 minutes.

Annex A
(*Clause 6.3***)**

PROCEDURE FOR MEASUREMENT OF CUSH-CUSH (CANE FIBRE) IN UNSCREENED AND SCREENED JUICE

A-1 FIELD OF APPLICATION

This procedure is used to analyze the performance of the rotary juice screen in respect of quantity of cush-cush in unscreened and screened juice.

A-2 PRINCIPLE

Cush-cush or cane fibre in screened juice (after passing through rotary juice screen) is measured on oven dry basis.

A-3 APPARATUS

A-3.1 *Cylindrical cush-cush tin*, having height 150 mm and diameter 100 mm with 75 microns screen at one end.

A-3.2 *Hot air oven*

A-4 PROCEDURE

A-4.1 Weigh minimum 1 kg of screened juice as W_1.

A-4.2 Weigh empty cylindrical cush-cush tin as W_3.

A-4.3 Filter the weighed juice sample through the cylindrical cush-cush tin. Use cold water to wash the residual 2-3 times to de-sugarize the cush-cush.

A-4.4 Keep the cush-cush tin containing residuals in oven at 100°C to 102°C temperature for drying. Dry until the constant weight is achieved. Take weight of cush cush or dry fibre in the sieve as W_2**.**

A-5 CALCULATION

$$\text{Cush-cush or fibre (W/W) \%} = \frac{W_2 - W_3}{W_1} \text{ X } 100$$

Where,

W_3 = weight of empty cylindrical cush-cush tin in grams.
W_2 = weight of empty cylindrical cush-cush tin and cush-cush or dry fibre in grams
W_1 = weight of sample in kilograms.