

ORIGINAL - GENUINE AND NOW GRANTED PATENT
HOT RAW JUICE ROTARY SCREEN

First time in the world

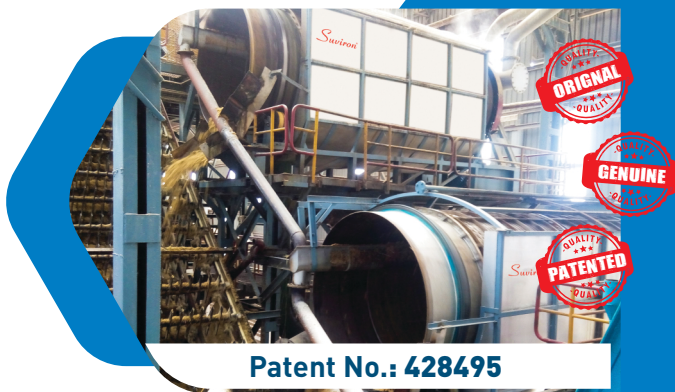
Lowest ever dry fibre solids in screened hot raw juice by using totally closed Hot Raw Juice – R.J.S., which operates on 'gravity-flow' principle. No double pumping of juice.

Patented 'equipment' and 'process'

Awarded 'Best innovative product' – of the year 2015-16 by Bharatiya Sugar.
Innovative Invention S.T. Taskar Award 2017 by Marathi Vidnyan Parishad.
'The G.S. Parkhe Award' for Innovation in Entrepreneurship-2019 by M.C.C.I.A.



Patent No.: 379825



Patent No.: 428495

**ROTARY JUICE SCREEN FOR
JUICE SCREENING**

World record highest 855 installations
in India and abroad
Patented two stage Rotary Juice
Screening System

**SUVIRON'S LOW RETENTION
TIME CLARIFIER (SLRTC)**

Highest 45 nos. of installations
in India and abroad



**SYRUP & MELT
CLARIFICATION SYSTEM
MULTI (DEEP) BED FILTERS**

Turnkey projects for "SULPHURLESS SUGAR"
production

Introduction:

Constant pursuit and consistent efforts to maximise removal of fine bagacillo from raw juice has led to invention of unique 'Hot Raw Juice Rotary Screen'.

Major quantity of fibre solids are removed from raw juice at mill house R.J.S. (~85%) and balance task of ~ 10% is accomplished by this R.J.S. allows improved 'juice clarification'.

The screened raw juice from mills is generally heated to 75-80 deg. C prior to liming and sulphitation. After heating of juice the natural advantage of increase in fibre particle size and good reduction of viscosity was considered as key point to develop a new Rotary juice screening technology for screening of hot raw juice using much lesser opening screen. This totally closed Rotary Juice Screen being located in between SO₂ absorption tower and juice sulphiter / defecator operates on 'gravity-flow' principle. Adequately insulated Rotary Juice Screen has shown very negligible temperature drop.

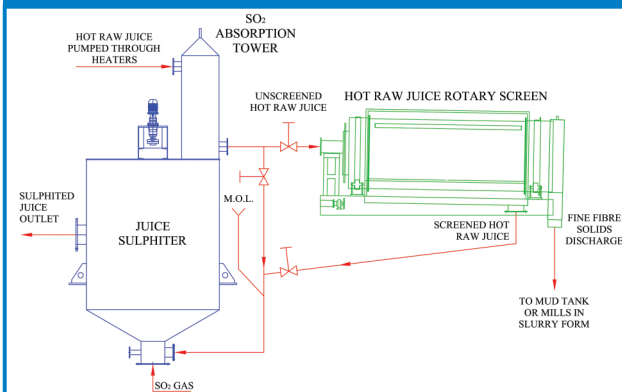
Dry fibre content of juice was analyzed using ICUMSA Method GS7-13 (1994) and following are the findings.

Screened raw juice from mills : 1700 - 2000 PPM ($\cong 1.7$ to 2.0 g/l)

Screened hot raw juice : Less than 500 PPM ($\cong 0.5$ g/l)

To get best out of this unique technology specifically to suit individual sugar factory site conditions we offer free expert technical advice from our senior Sugar Technologist.

'Gravity flow' - process diagram of hot raw juice rotary screening system:



Patented 'equipment and process'
(Patent No. 379825)

Installations:

We have so far designed, manufactured and successfully commissioned **54 nos.** Rotary Screens for hot raw juice screening. Few of our recent installations are as under :

Balrampur Chini Mills Ltd. (Balrampur Unit)	02 Nos.	Saisidha Sugar Equip. & Engg. Co. Pvt. Ltd. - Kamuli Sugars Ltd., Uganda	01 No.
Balrampur Chini Mills Ltd. (Babhnan Unit)	02 Nos.	Jarandeshwar Sugar Mills Pvt. Ltd.	04 Nos.
Vishwaraj Sugar Industries Ltd.	01 No.	Dalmia Bharat Sugar Industries Ltd. (Nigohi unit)	02 Nos.
Shree Prabhulingeshwar Sugars & Chemicals Ltd.	04 Nos.	Rajarambapu Patil S.S.K. Ltd.	02 Nos.
Aayan Multitrade LLP	02 Nos.	Daund Sugar Pvt. Ltd.	02 Nos.
Natural Sugars & Allied Industries Ltd.	02 Nos.	Krantiagrani Dr. G.D. Bapu Lad S.S.K. Ltd.	02 Nos.
		Khatav Man Taluka Agro Processing Ltd.	01 No.

Year-wise installations:

Years	2015	2016	2017	2018	2019	2020	2021	2022	2023
Nos.	2	5	7	7	7	6	7	8	5

Multiple advantages:

Various multiple advantages were achieved at all the installations with little variations.

- Reduction of Clear Juice colour.
- Reduction of Clear Juice turbidity and improved transmittance.
- Additional bagasse for extra power generation, when slurry is recycled to mills.
- Lowest fibre in screened hot raw juice - less than 500 PPM ($\cong 0.5$ g/l).
- The Beverage floc test - Always 'Negative' using ICUMSA GS2/3-40 method.
- Sediments - Using ICUMSA GS2/3/9-19, always much below the desired norm of 100 mg/kg as per specifications given by beverage manufacturer.
- Reduced solid and colour loading on subsequent clarification process of mixed juice, filtrate, syrup and melt.
- No fibre contamination of sugar crystal; Improvement in sugar colour.
- Other advantages like no chocking at pumps, headers and PHE.

Introduction:

Continuous juice screening is effected on a welded wedge bar screen in cylindrical shaped drum mounted in horizontal position with appropriate slope towards non-drive end. Unlike in case of stationary parabolic screen the entire screening area provided in the rotary screen is fully utilized and hence maximum screening efficiency is achieved. The dynamic movement of screen allows utilization of smaller size wedge bar opening for removal of bagacillo from mill juice. The diameter, the length of the screen, the speed of the rotating screen and its inclination are suitably designed to facilitate proper drainage of juice. Maximum juice is removed in the first 30% section of the screen and the balance de-watering takes place in the remaining 70% of screening area. Special design feature of automatic timer operated periodical cleaning of the screen by application of hot water through flat cone nozzles ensures clean screen surface throughout the operation period.

Construction:

The screening area comprises of welded wedge bar screen drums joined together by bolting arrangement. Towards the drive end side of the end drum the driving sprocket is mounted on output shaft of gearbox and connected to driven sprocket fitted on rotating drum to transmit the power through heavy-duty chain arrangement. Thrust rollers fitted at the non-drive end absorb the lateral thrust developed by inclined rotating drum. The mill juice being at atmospheric temperature the hood construction is of 'top open' type. Flat cone stainless steel spray nozzles are fitted on stainless steel piped header mounted on the framework of side hood and covers the entire length of screen drum.

The end drums with screen drums are shop assembled and empty run trial for continuous 48 hrs. is conducted at our works prior to dispatch.

Operation:

The unscreened juice containing suspended solid particles comprising fine and coarse bagasse particles enters continuously from drive end of the drum through a distributor. The screened juice is collected in the sloping half cylindrical shape bottom trough for quick removal of screened juice to screened juice receiving tank. The solid mass keeps on rolling on the wedge bar screen during its forward movement towards discharge end where the remaining juice is also drained away leaving the solid mass on the screen which is discharged to cane / bagasse blanket by gravity.

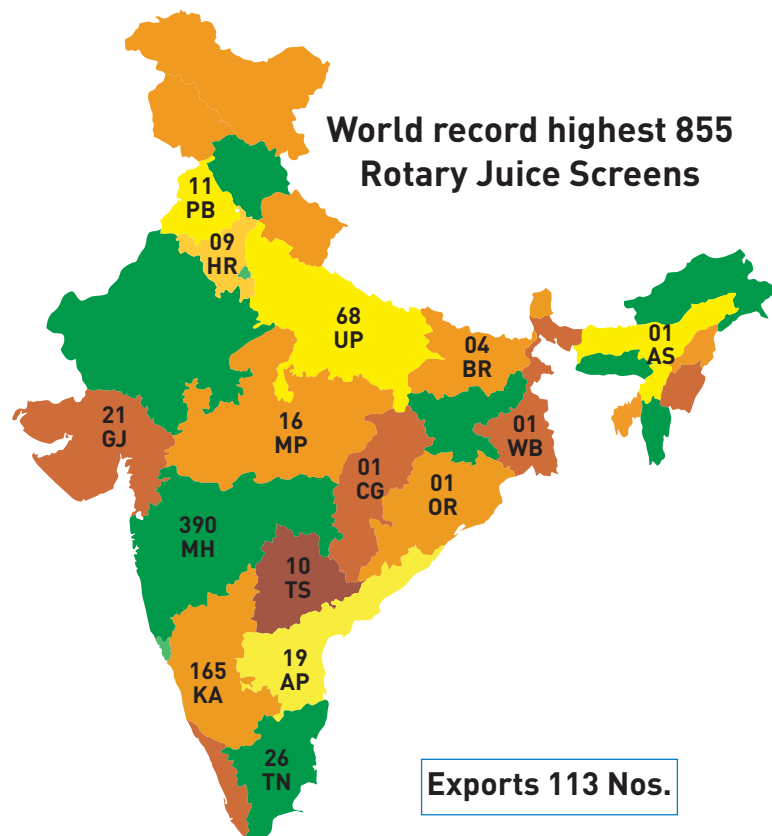
The automatic washing system is operated through adjustable digital timer with 1 minute to 99 minute 'ON Time' and 1 minute 99 minute 'OFF Time'. Periodical cleaning of Rotary Juice Screen is carried out without stoppage.

Installations:

Most humbly we are proud to mention that right from the beginning we are top in Rotary Juice Screen installations and have so far supplied more than **855** units, highest in the world. The client network covers entire India and various sugar producing countries all over the world, as mentioned in the table of RJS map. In addition to our direct supply to sugar factories we regularly supply Rotary Juice Screens to various complete sugar plant OEMs.

We have supplied Rotary Juice Screen to handle crushing capacity of 500 TPD upto 12,000 TPD plants. Smaller size Rotary Juice Screen of any desired capacity is supplied to cater the needs of Jaggery plants, mini sugar plants and beet sugar plants.

Rotary Juice Screen installations - state wise in India and country wise abroad



Country	No.	Country	No.
Burkina Faso	01	Rwanda	01
Cambodia	01	Sierra Leone	01
Ethiopia	12	Tanzania	08
Guyana	01	Thailand	02
Indonesia	07	Uganda	18
Iran	01	USA	08
Kenya	19	Vietnam	09
Malawi	01	Zambia	01
Mauritius	01	Cameroon	01
Nigeria	04	Sri Lanka	02
Peru	02	Nepal	01
Columbia	01	Bangladesh	01
Philippines	07	T-Chad	01
UAE	01		
Total		113 in 27 countries	

Introduction:

We are pioneer in designing and manufacturing of Suviron's Low Retention Time Clarifiers having **45** nos. to our credit including **6** nos. exported.

Salient features:

Retention Time:

Good settling is achieved with less retention time. The retention time that depends upon "initial rate of settling" varies between 45-55 minutes according to process parameters and maximum removal of fibre from mixed juice.

Suspended Particles:

Brilliant clear juice free from any suspended solids.

Sucrose Inversion Loss:

Less retention time hence less risk of sucrose inversion loss.

Temperature Drop:

Less temperature drop of only 2 to 3 degree C. due to less heat exposed area.

Mud Consistency:

Compact mud formation for achieving better vacuum filter/decanter performance.

Colour of Clear Juice:

Less risk of new colouring matter formation due to reduced exposure to heat.

Turbidity of Clear Juice:

5 – 10 IU for sulphitation plant and 15 – 20 IU for defecation plant depending upon operational techniques and maximum removal of fibre from mixed juice.

Simple Maintenance:

Simple in maintenance – e.g. mud outlet valve is "the only" valve required in regular operation. No sealing rings around central shaft. There is only one set of scrapper having four arms each fitted with multiple scrapper plates moving on one single tray for mud scraping.

Optimum Settling Aid Polymer:

Optimum consumption of polymer flocculent achieved by its homogeneous mixing with juice prior to feed launder. The cost involved in polymer addition is affordable and quite economical considering the multifold advantages gained.

Wide Range of Application:

Wide range of application for clarification of cane juice, secondary juice, filtrate juice, sweet sorghum juice and beet juice; as already being practiced at various sugar factories.

Foundation Cost:

Due to less juice load and self-weight of low retention time clarifier the cost of foundation is comparatively less.

Building Cost:

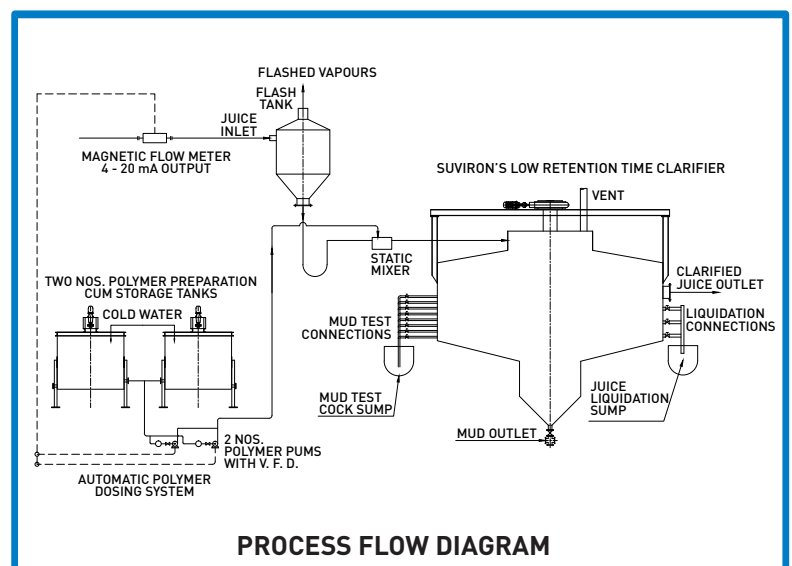
Outdoor installation is preferable as there is no any particular operation or attention required around clarifier. Therefore the cost on account of building is totally avoided.

Cost Economics:

Technology offers forever long life saving of ₹ 6/- per ton cane crushed.

Recent SLRTC installations:

- ▶ Gangakhed Sugar And Energy Ltd.
- ▶ Olam Agro India Pvt. Ltd.
- ▶ Bannari Amman Sugars Ltd. (Madras Sugars)
- ▶ Gobind Sugar Mills Ltd.
- ▶ Shri Sai Priya Sugars Ltd.
- ▶ Agroaurora S.A.C. - Peru
- ▶ Nirani Sugars Ltd.
- ▶ PTMSM - Indonesia
- ▶ Twenty One Sugars Ltd.- Repeat order
- ▶ MRN Cane Power (India) Ltd.
- ▶ Bagamoyo Sugars Ltd., Tanzania
- ▶ Shri. Balaji Sugar And Chemicals Ltd.
- ▶ Bilagi Sugar Mill Ltd.
- ▶ Daund Sugar Pvt. Ltd.



We also undertake conversion of existing conventional clarifiers to SLRTC. We offer the complete package of SLRTC along with process automation for stabilized flow, Auto pH control, Auto temperature control at sulphited / defecated juice heater and automatic dosing of polymer proportionate to juice flow rate.

Introduction:

While designing the system more thrust is given to the simplicity of the operation with optimum level of chemical consumption. The Syrup / melt normally has a brix of 60-62 deg. and the impurities have to be separated from the mother liquor in the form of scum that rises to the top of the surface which eventually is separated leaving the clarified liquor to be forwarded to the next unit process.

Calcium Tri-Phosphate is universally known as the best colour adsorbent and hence, the first step in the system is production of Calcium Tri-Phosphate by treating the syrup / melt with Lime Saccharate and Phosphoric acid in a specially designed reaction vessel to accomplish the reaction with provision of optimum reaction time for completion of the reaction kinetics. The syrup / melt is heated to 80 to 85 deg. C. before reaction vessel to achieve the desired reaction kinetics.

The next step is aeration of the syrup / melt for forming of micronized air bubbles which by virtue of its fine size adheres to Calcium Tri - Phosphate precipitate and other insoluble impurities.

In the specially designed short retention time floatation clarifier the air bubbles are allowed to have the shortest path to the top surface and the clarified syrup / melt is withdrawn at the most silent zone. The air bubbles after reaching to the open top surface burst into atmosphere and the scum which is accumulated on the top of the surface is continuously pushed by raker arms into the scum channel.

A telescopic valve is provided in the outlet line of clarified liquor to precisely monitor level of syrup / melt in the clarifier so that only the scum comprising of impurities is removed.

In order to activate and boost the floatation phenomenon a floatation aid polymer which enhances kinetics of floatation is added prior to clarifier.

Although major part of colouring matter gets adsorbed in the Calcium Tri-Phosphate the part which remains in the soluble form is precipitated by homogenously mixing of the liquor with the colour precipitant.

Salient features:

- ▶ Optimized automatic chemical dosage allows minimum recurring cost on account of chemical inputs.
- ▶ No proprietary branded / chemical formulation; instead, off- the -shelf chemicals as available in open market are advised allowing reduced chemicals costs. Further there is no dependability on any particular source.
- ▶ Unique design features allows dual capacity utilization. Best turndown ratio of 0 to 50%
- ▶ Fully automatic dosing of all the four chemicals viz. Lime Saccharate, Phosphoric acid, colour precipitating agent and floatation aid polymer in proportion to Syrup / Melt inflow at pre-set, pre-tested dosage.
- ▶ Well stabilised Syrup / Melt inflow controlled by using VFD at raw syrup / melt pump motor.
- ▶ Auto pH control system.

Multi (Deep) Bed Filters:

Clear melt generated from Melt clarification system contains fines and colloidal suspended solids that create visual turbidity. To improve final sugar quality it is necessary to remove these colloidal or suspended solids.

The Multi (Deep) bed filter works as a filtering unit after clarification to trap the fine colloidal suspended particles escaped from melt clarifier.

The basic concept of using multi bed filter to filter raw sugar melt is borrowed from the conventional sand filter having single layer sand filter. However, considering the nature of fine colloidal suspended solids contained in raw sugar melt the multi bed filter is used with 6 layers of graded filtering media. All the operations at this unit are provided with complete automation.

Installations:

- ▶ Natural Sugar And Allied Industries Ltd.
- ▶ West Kenya Sugars Ltd. - Kenya
- ▶ Gangakhed Sugar And Energy Ltd.
- ▶ Madhucon Sugar And Power Industries Ltd.
- ▶ Vijayanagar Sugar Pvt. Ltd.
- ▶ Deccan Sugar Pvt .Ltd.
- ▶ Venkateshwara Power Project Ltd.
- ▶ Egmore Sugars. - Guyana Sugar Corporation - Guyana
- ▶ Vilas S.S.K. Ltd.
- ▶ Lokmangal Mauli Industries Ltd.
- ▶ Nzoia Sugar Company Ltd. - Kenya
- ▶ Sar Senapati Santaji Ghorpade Sugar Factory Ltd.
- ▶ Gobind Sugar Mills Ltd.
- ▶ ISP Sugar Refinery Pvt.Ltd.
- ▶ MRN Cane Power (India) Ltd.
- ▶ Twenty One Sugars Ltd.
- ▶ Shri Sai Priya Sugars Ltd.
- ▶ Athani Sugars Ltd., at three units, Bambwade, Rayat & Shivneri Sugars.

Introduction:

In India plantation white sugar is produced mostly by using double sulphitation process i.e. juice sulphitation during juice clarification followed by syrup sulphitation. The sugar produced by double sulphitation contains higher quantity of sulphur in the range of 20 to 70 ppm or may be higher depending upon the operation of individual sugar factories.

Due to higher sulphur content in sugar produced in Indian sugar mills it is not accepted in International market. As per international norms sulphur content of sugar should be less than 20 ppm.

In case of sulphitation process the equipments in operation get corroded requiring costly repair, maintenance and replacement.

In view of growing awareness to use sulphurless sugar for the benefit of human body, safeguarding environment and reducing additional production cost etc. it is now high time for Indian sugar industry to switch over to production of sulphurless sugar.

Process :

In order to produce sulphurless sugar the existing double sulphitation process is changed to defecation process to produce VVHP/VHP raw sugar having colour in the range of 400 to 700 IU. The raw sugar produced is remelted followed by melt clarification system using phosphofloatation and melt filtration using multi (deep) bed filters. The filtered melt is sent to further process of pan boiling, crystallization, centrifugation to produce final sulphurless sugar.

The melt received from Melt Clarification System has brix of 60 – 62° and impurities are to be separated from the mother liquor in the form of scum that rises on the top of the surface.

Prior to clarification of melt, the melt is treated in specially designed reaction vessel by adding Lime Saccharate and Phosphoric acid followed by aeration of the melt for forming of micronized air bubbles which by virtue of its fine size adheres to Calcium tri-phosphate precipitate and other insoluble impurities.

In specially designed floatation clarifier air bubbles are allowed to have the shortest path to the top surface and the clarified melt is withdrawn at silent zone. The air bubble after reaching the top surface burst into atmosphere and the scum is accumulated on the top is continuously pushed by raker arms into the scum channel.

The clear melt from melt clarification system contains fines and colloidal suspended solids that create visual turbidity. In order to improve the final sugar quality it is essential to remove these colloidal or suspended solids by melt filtration using multi (deep) bed filter.

The process of depositing sucrose solids from the mother liquor to form a specific well defined rhomboidal shaped sucrose crystal structure is termed as 'crystallization' and is a great Gift from 'mother nature'! This very natural phenomena is used for purification in the stepwise process of producing 'Sulphurless Sugar' from Raw Sugar.

The maximum colour removal occurs during crystallization stage prior to which the partial task of colour and solid removal is accomplished at Melt Clarification System and deep bed filter.

The turnkey projects includes all equipment like Evaporator, Pan, Crystallizer, Sugar Dryer and Sugar Handling.

By adding IER, BRS and RWRS system to above stream, 'refined sugar' as per ICUMSA standards and international norms can be produced.

Advantages of production of sulphurless sugar

1. Most important is to eliminate highly toxic SO₂ thereby corrosive levels are negligible resulting into improved life of equipment with its piping and other adjacent equipments including building.
2. 100% saving in sulphur cost and around 30-35% saving in lime cost.
3. Reduction in scaling of heaters and evaporators resulting into reduction in cost for de-scaling.
4. Good exposure for sugar to International market.
5. Improved keeping quality as compared to sugar produced using double sulphitation process.
6. Lower insoluble matter in final sugar due to removal of fine bagacillo particles during melt clarification & filtration.
7. During the production of raw sugar and sulphurless sugar near-neutral pH is maintained thereby less risk of inversion loss and possibility of rise in recovery.
8. White sulphurless sugar meets the various parameters as specified out by beverage manufacturers.
9. Improvement in quality of final molasses and higher yield at distillery.

Installations:

We have installed and successfully commissioned complete system comprising of raw sugar melting, raw sugar melt screening, melt clarification system, melt filtration system and three stage scum desweetening system at,

▶ MRN Cane Power (India) Ltd. Badami, Dist: Bagalkot

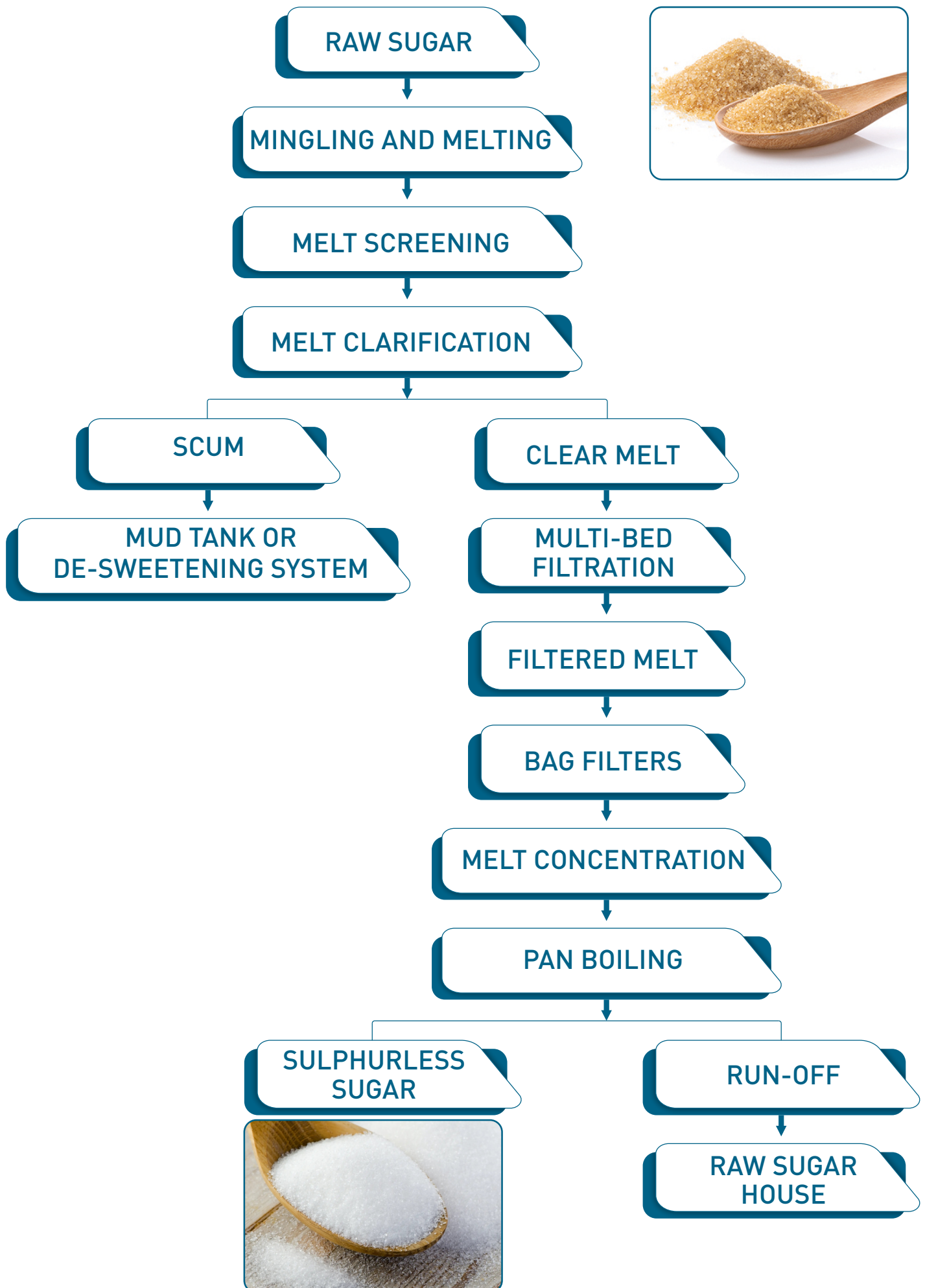
▶ Shri Sai Priya Sugars Limited, Hippargi Village, Jamkhandi

▶ Vijayanagar Sugar Pvt. Ltd., Gadag, Karnataka

with excellent performance results.

BLOCK DIAGRAM OF SULPHURLESS SUGAR PRODUCTION

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