



Some amazing new technologies from SSS International Ltd.SM

Over the last three years, the research team at **SSS InternationalSM** have been working hard developing new technologies in juice clarification, purification and separation within the cane sugar processing industry. These process areas are notoriously fickle and often practised in a poor manner using old technologies dating from the nineteen sixties. The team at **SSS InternationalSM** draw upon their many years of experience in the sugar industry together with their business partners and consultants.

It is now possible to up-grade old plant equipment to incorporate these latest **SSS InternationalSM** technologies in order to improve factory operation resulting in better all-round performance. Many of these up-grades are based upon sound technologies using straight forward applications of improved flows and controls, which assist in raising station throughput and yield, while saving on combustible fuels.

Super-Short Retention Time Juice Clarification

Since the introduction of polyelectrolyte flocculants and the development of the tray-less juice clarifier in the late 1960s, little has changed in juice clarification in four decades. While some cane factories have been slow to adopt trayless clarifiers, others have struggled to achieve the reduced residence times claimed by suppliers; less than forty minutes' retention time.

In locations where there are sizeable factories such as in Thailand, tray-less clarifiers are almost the only type of clarifier in operation, generally achieving target retention times. There are many variations having quadrant juice feed, castellated or perforated plate feed; all of which operate to similar effect, some with claimed superior performance.

A radical new approach has been adopted by **SSS internationalSM** where the feed launders have been virtually removed. With improved flocculation, separation is easily achieved in less than 5 minutes!

Take a sample of treated juice feeding a juice clarifier (in a glass measuring cylinder), and you will see a clear separation in just seconds.

This new Super-Short Retention Time Clarifier designed by **SSS internationalSM** is now successfully operating in cane sugar factories. A single juice clarifier of 12 metres diameter is designed to treat up to 24,000 tonnes of juice per single day.



The savings from shorter retention time in juice clarification can be measured in a number of ways. Capex installation costs being drastically reduced. Shorter retention means less destruction of sucrose. In a large capacity factory the extra yield is calculated at around \$100,000 US Dollars every season. Then there are other benefits of improved juice quality, less steam consumption, and no need for DSM screens. Old tray-less design clarifiers can easily be up-graded to double capacity while improving quality.

New Super-Short Retention Time Juice Clarifier

Juice Clarification Automatic Flocculant Preparation

For all process stations which use flocculant, there is now a low cost method for the preparation of flocculant solutions. Operators typically have to prepare flocculant three times every day, a laborious manual operation. But, automating flocculant preparation is more problematic than it sounds! Ejector systems stick-up with the powder and need constant attention. Other low cost systems jam-up with sticky residue, and operators are reluctant to clean.



Regardless of the system used for preparation, operators are still usually required to manually prepare flocculant solutions every shift, which is both time-consuming and laborious. SSS International has developed a low-cost method for preparing solutions automatically. This makes preparation more reliable and less arduous, providing reliability and consistency to factory processing.

Automatic Flocculant Preparation

***AutoCrystal*® Automatic Vacuum Pan Boiling System**

AutoCrystal is a completely new control strategy. The ULTIMATE in batch pan control technology. A system which really works in full automatic with no water addition.

The AutoCrystal method has been developed to calculate accurately for control purposes the crystal content, mother liquor purity and supersaturation from measured parameters. The calculated value of supersaturation in real time is used as a process variable to control the boiling, so that the massecuite is maintained at fixed supersaturation. This method has been tested and is successfully working in a highly automated refinery.



The results of automating a batch pan in this way achieves many benefits including improved crystal quality and reduced recycle of sugar. The elimination of water during boiling is a key advantage, reducing the boiling time and saving steam, all of which assist in making superior sugar in the most efficient manner.

Typical Vacuum Pan Installations

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Bagacillo Removal Strainer Separator

A common problem in sugar factories is the carry-over of bagacillo and residual flocculated particles into the clear clarified juice. Many factories strain the juice over DSM screens, which are crude items of equipment requiring constant manual cleaning. They are also thermally extremely inefficient due to vapour escape from an open to atmosphere system. Factories which require a higher quality product such as direct consumption white sugar, use flat inclined screens which also require continuous operator attention. Flat screens typically have 100 micron polypropylene cloths which are continually scraped clean by casual staff.

The DSM and flat screens can be easily replaced with superior technology self-cleaning screen separators, offered by **SSS international**SM. Totally enclosed, and utilising technologies well-established in the food industry, this new application is successfully operating in sugar factories around the world.



Samples of Bagacillo and Impurity Filtered out from Juice Streams

Strainer for Clarified Syrup

Syrup clarification was developed some forty years ago with outstanding results. However, the system was only used by a handful of factories due to complex processing requirements and understanding of the process. Over time, the benefits of syrup clarification such as increased BHR recovery and improved sugar

quality have been recognised as being highly successful, and the process has again become popular. The process has been installed by many of the superior operating sugar factories world-wide.

In some factories there are problems of operating the syrup clarification process at high Brix concentrations; above 60° Brix is difficult to achieve. This is due to high viscosity and high entrained suspended matter, resulting in unacceptable carry-over of particulate matter into the clarified syrup.

Modification of the clarifiers and the addition of a **SSS international**SM syrup strainer/ separator, it is possible to eliminate carry-over from clarified syrup. Up-grade of clarifiers is offered by **SSS international**SM to accompany the new strainers.

These improvements allow operators to run at higher Brixes for improved quality and efficiency.



Typical Strainers

New Powdered Activated Carbon (PAC) Treatment in Refining; Reducing and Eliminating Filter-aid

The use of Powder Activated Carbons in the food & beverage industries is very common. The process is operated by household food brands and is a well proven process which acts as a decolouriser, deodoriser and purifier.

The PAC process is less widely used in the sugar industry since the process can be both messy if not properly managed, and expensive due to the once-only-use of carbon and filter-aid.

Efficient lower cost carbons are now available, and with new processing techniques to reduce/ eliminate filter-aid use, operating costs have come down considerably. The PAC process is worthy of re-evaluation.

The use of PAC can be considered a boost to current processing methods to reduce colour further, or as a process, in its own right. As supplier companies advertise other 'formulations' to increase processing power, there is now a proven method to achieve further decolourisation so many sugar processors crave.

PHOSPHATATION – simply add carbon to syrup/ liquor and remove with the assistance of phosphatation. Simple operation. Very little addition of capital plant.

CARBONATATION – simply add to the liquor to increase decolourisation. Additional plant required.

As with all processing methods, the technique is not as simple as adding carbon to process without some additional equipment, and attention to detail is required to ensure correct method and procedure.



Carbon Treatment Plants

Effluent Treatment Plant (ETP) – Waste Phosphatation Scum / IER Effluent / Vinasse

The treatment of effluent waste is becoming a significant problem in many sugar factories and refineries. There are many methods available to treat these waste solutions depending upon customer, available land, systems installed, services and facilities at the ETP, such as connection to the local sewerage systems etc. In most locations costs involved can be very significant, especially when local authorities become involved.

A significant sugar refinery effluent is IER spent brine, notable due to the high volumes of liquid. Treatment by membrane is an excellent solution to recover brine for re-use, making the IER process lower operating cost. However, membranes are high cost and require significant maintenance. Even after membrane installation, the effluent volumes are still high.



Now there are new low cost methods of treatments of waste effluents with a view to reducing water contents to manageable quantities to enable easy disposal of wastes. In many cases, semi/solid waste can be sold or used in other industries.

Effluent Treatment at Refineries

Modern Refinery Filtration Systems

Treatment of refinery liquors & liquid sugar syrups by filtration is essential. Filtration is not easy to manage and operate efficiently. However, fully automated systems can provide filtered products and de-sweetened dry cake discharge for simple managing and handling of products and wastes. Modern methods provide clean and easy vacuum preparation for carbons and filter-aids for complete dust-free environments. These systems are installed for the manufacture of pharmaceutical grades of sugar, and employ good operating practises for high quality superior sugar manufacture.



Modern Filtration & PAC Preparation Systems

Factory De-scaling Systems

Scaling is a severe problem in virtually all sugar mills. Now, there is a revolutionary non-chemical method that can help with reducing scale. Based on complex frequency modulation, this electronic technology agitates charged components inside sugar juice, transforming calcium and bi-carbonate ions into soft crystals that do not adhere to hot surfaces of equipment.

The benefits of reduced scale and softer scale will enable longer factory operation run-time, and reduced down-time maintenance. The scale composition is easy to clean, which reduces actual cleaning time and provides longer life for capital equipment. There are many added benefits such as reduced need for chemicals.

These systems provide an easy non-intrusive installation and are a low energy technology solution.



Heating tubes showing before & after treatment using SSS internationalSM Treatment systems

Short Retention Time Conditioning

Refined sugar which is dried and packed for distribution has a small amount of moisture present. Even with the most efficient Centrifuging and Drying Processes, a small amount of water is left on the surface of refined sugar crystals as a syrup layer. Over a relatively short time this syrup layer changes into crystallised sugar and free water. When the packed sugar is subject to daily temperature variation, the free water will move around the pack and cause the crystals to stick together to form caking.

As quality standards become higher and more refined sugar is exported, this caking can give rise to an unacceptable level of Customer Complaints and sometimes rejected sugar.

Conditioning is the further removal of moisture from the sugar in a controlled way to minimise the chance of product caking. The reasons for sugar caking are complex, and treatments involved usually require significant equipment which is costly. One solution to avoid caking is further drying of the sugar in large silos by blowing de-humidified air through the sugar. This method is time consuming and requires around 48 hours retention time of the sugar in large specialised silos.



In order to achieve short retention/ rapid conditioning, an advanced combination of specialised sugar drying and indirect contact cooling is combined to provide fast results. In most existing installations, simple modifications to the sugar dryer are all that is required, plus additional conveying equipment and a specialised cooling silo. The cooling silo consists of indirect cooling plates which allow rapid heat transfer for cooling of the sugar while purging with de-humidified air.

Cooling Conditioning