TREATMENT OF FILTRATE FROM ROTARY VACUUM FILTERS TO AVOID RECYCLING

By

SUNIL SINGHAL¹, ANUP KESARWANI¹, O.P. SHARMA² and A.K. ARYA²

¹Chemical System Technologies (India) Pvt. Ltd. New Delhi, India
²SIEL Sugar Complex, Titawi, Muzaffarnagar, U.P., India
chemsystems@vsnl.net

KEYWORDS: Filtrate, Recycling, Losses, Clarified Filtrate, Clear Juice.

Abstract

Conventionally, the filtrate from the rotary vacuum filters is sent back to the mixed juice that is again chemically treated before entering the clarifier. This causes sucrose loss due to inversion and also, indirectly, due to higher molasses production. A system was developed to treat the filtrate so that it can be sent directly to the evaporators along with the clear juice thus eliminating the recycling. The system was installed in a 5000 TCD plantation white sugar mill. For more than six months, the clarified filtrate from this system was continuously being sent to the evaporators. Additionally, liming and sulfiting of this filtrate was avoided resulting in lower molasses tonnage. The color of the clear juice was lower, and the resulting sugar had lower color and turbidity.

Introduction

In almost all cane sugar mills, the standard procedure is to recycle the filtrate from the rotary vacuum filters back to mixed juice. The mixed juice is subjected to liming in raw sugar factories or to liming and sulfitation in the plantation white mills before sending to the clarifier. The filtrate quantity generally ranges between 13-20% on cane; hence, this constitutes a significant portion of the juice to be recycled.

The losses associated with the recycling are well documented. Sucrose inversion losses are substantial. The addition of inorganics (lime/sulfur) increases the molasses quantity and the sucrose loss in molasses, therefore, is more. Colour and turbidity increase in the clear juice and this has a direct and negative impact on sugar quality.

Although phosphoflotation based systems are being used in some mills for the clarification of filtrate, the quality of such a treated filtrate is not comparable to that of the clear juice. The main reason for this is the frequent carry-through of the flocs created in the flotation cell. This happens because of fluctuation in the operating parameters. The system is, for example, quite sensitive to pH change. When the filtrate, with the 'carried-through' flocs, is pumped using a centrifugal pump, these flocs disperse and increase the turbidity.

The new filtration system has been designed to remove the carried-through flocs as the major step and, with some improvements in the phospho flotation system, to ensure that the clarified and filtered filtrate is of a quality equivalent to clear juice.

Method

Data were collected from seven different sugar mills where phosphoflotation based filtrate clarification systems were running to determine the incidence of carry-through of flocs in the clarified filtrate and to compare the color and turbidity of the clarified filtrate with that of the clear juice. Automatic flow control was installed so that surges did not disturb the flotation cell operation. Temperature was also controlled with the use of automatic steam valves. pH was maintained between 6.6-6.8 as that was found to be the best range for maximum clarity and floc separation. Aeration control was achieved through rotameter-based readings being used for valve opening on the pump suction side.

Various filters and filter media were tried over three consecutive crushing seasons to arrive at the most effective combination. Ease of operation and back-wash was also considered so that continuous
operation could be maintained. A two stage filtration system proved best; the first stage being a precision screening at around 150 μ opening and the second stage being a medium with a 10 μ opening. This two step system ensures total removal of insolubles and reduces turbidity.

**Observations**

The clarification process was run for one week in the conventional manner where the filtrate was being recycled to the mixed juice. Then the new system of filtrate phosphoflotation and filtration was run for a week. Clear juice purity, CaO concentration, transmittance and colour were measured at regular intervals throughout the trial. The new system clear juice was composed of the mixture of the clarifier juice and the flotation system filtered juice.

This sequence was repeated three times during the crushing season.

The typical improvements in clarified juice quality (differences, new system – conventional system) were:

- Purity rise : 0.15 units.
- CaO reduction : 16.5%.
- Transmittance : 18%.
- Colour : 15%.

**Conclusions**

The overall advantages for any sugar mill are likely to include:

- lower sucrose losses;
- reduced scaling in evaporators and pans;
- lower final molasses quantity;
- reduced viscosity at vacuum pans;
- reduced cost of input chemicals;
- superior sugar quality – lower colour;
  - lower suspended matter;
  - lower turbidity.

**Acknowledgement**

The contribution and assistance provided by the management of SIEL Ltd. is gratefully acknowledged. Authors also acknowledge the dedicated efforts of the Chemical Systems Technologies team.
LE TRAITEMENT DU FILTRAT DE FILTRES ROTATIFS POUR ÉVITER LE RECYCLAGE

SUNIL SINGHAL¹, ANUP KESARWANI¹, O.P. SHARMA² et A.K. ARYA²

¹Chemical System Technologies (India) Pvt. Ltd. New Delhi, India
²SIEL Sugar Complex, Titawi, Muzaffarnagar, U.P, India
chemsystems@vsnl.net

MOTS CLEFS: Filtrat, Recyclage, Pertes, Clarification du Filtrat, Jus Clarifié.

Résumé

HABITUELLEMENT le filtrat est retourné au jus mélange; il est donc traite chimiquement une seconde fois. Cela cause des pertes de saccharose par inversion et, indirectement, par l’augmentation de la production de mélasse finale. On a développé un système pour produire un filtrat qui peut être envoyé directement aux évaporateurs, ce qui évite le recyclage. On a installe ce système dans une sucrerie de 5000 TCD, produisant du sucre blanc de plantation. Pendant plus de 6 mois le filtrat a été envoyé sans arrêts’aux évaporateurs. Ce système permet aussi d’éviter le chaulage et la sulfuration du filtrat, ce qui réduit la production de mélasse. La couleur du jus clarifie s’est améliorée ce qui a cause une diminution de couleur et de trouble dans le sucre.

TRATAMIENTO DEL FILTRADO DE FILTROS ROTATORIOS AL VACÍO PARA EVITAR RECICLAMIENTOS

SUNIL SINGHAL¹, ANUP KESARWANI¹, O.P. SHARMA² y A.K. ARYA²

¹Chemical System Technologies (India) Pvt. Ltd. Nueva Delhi, India
²Complejo Azucarero, Titawi, Muzaffarnagar, U.P, India
chemsystems@vsnl.net

PALABRAS CLAVE: Filtrado, Reciclamiento, Pérdidas, Filtrado Clarificado, Jugo Claro.

Resumen

CONVENCIONALMENTE, el filtrado de los filtros rotatorios al vacío se regresa al jugo mezclado, el cual de nueva cuenta es tratado químicamente antes de ingresar al clarificador. Lo anterior ocasiona una pérdida de sacarosa debido a la inversión y, adicionalmente, de manera indirecta debido a la mayor producción de melazas. Se desarrolló así un sistema para tratar el filtrado de manera que pudiera ser enviado directamente a los evaporadores, junto con el jugo claro, eliminando por tanto el reciclado. El sistema se instaló en un molino TCD 5000 para azúcar blanca de plantación. Por más de seis meses, el filtrado clarificado de este sistema se envió continuamente a los evaporadores. Adicionalmente, se evitó el encalado y sulfatado de este filtrado, lo que resultó en un tonelaje menor de melazas. El color del jugo claro era más bajo, y el azúcar resultante tenía un color y turbiedad más bajos.