



ISSCT

Factory Engineering & Processing Workshops

Processing And Engineering Options Towards More Competitive Factory Operations



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Research Center



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The LLT Clarifier: Factory Performance

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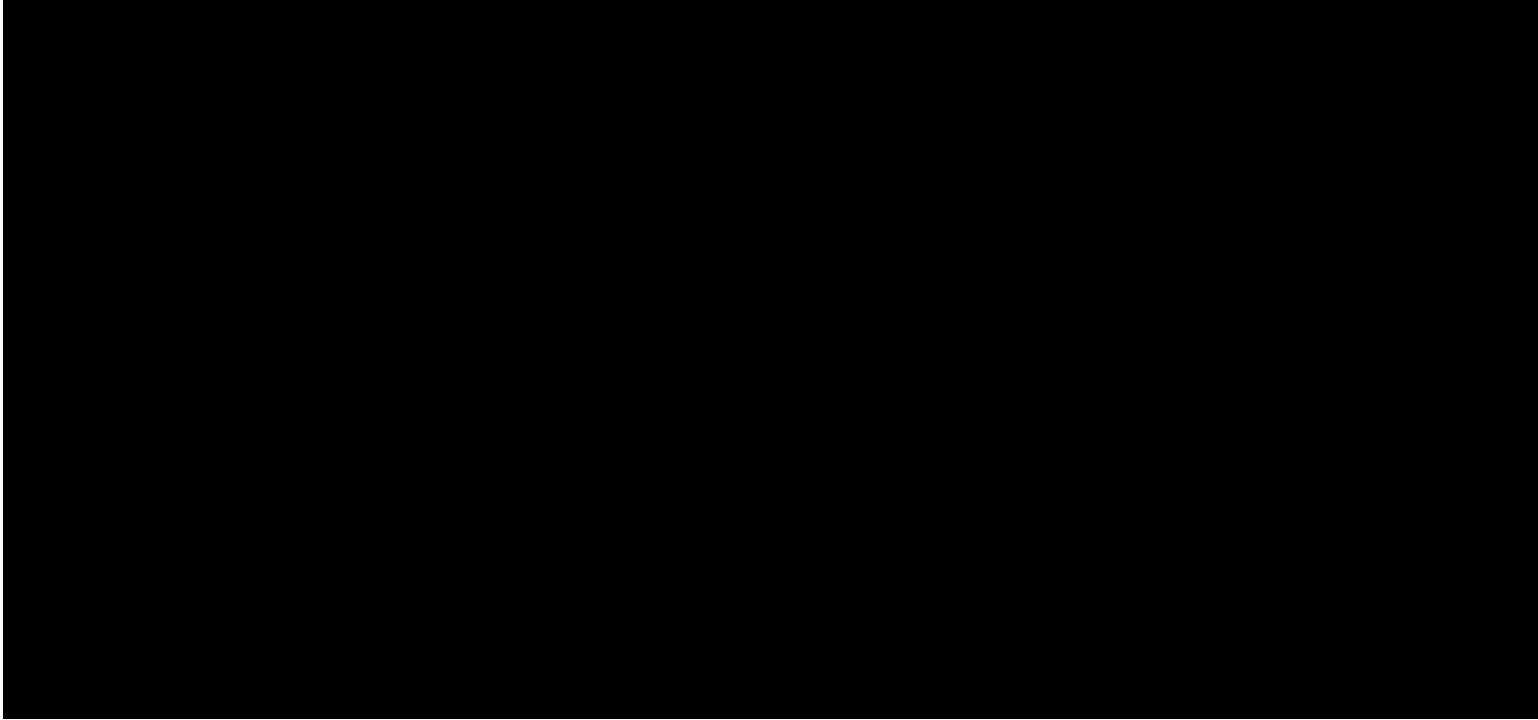


Introduction

- The LLT Clarifier is a type of Short Retention Time Clarifier with adapted Turbulence Reduction Devices (TRDs) that reduce juice momentum improving juice clarification.
- The LLT Clarifier can integrate a flash trough, avoiding the need for an external flash tank.
- Five factories have installed the LLT Clarifier located in Louisiana, Andhra Pradesh, and Guatemala.
- We have used the LLT Clarifier for mixed juice and mud filtrate clarification.
- This seminar intends to show and discuss some of the results attained with the LLT Clarifier.

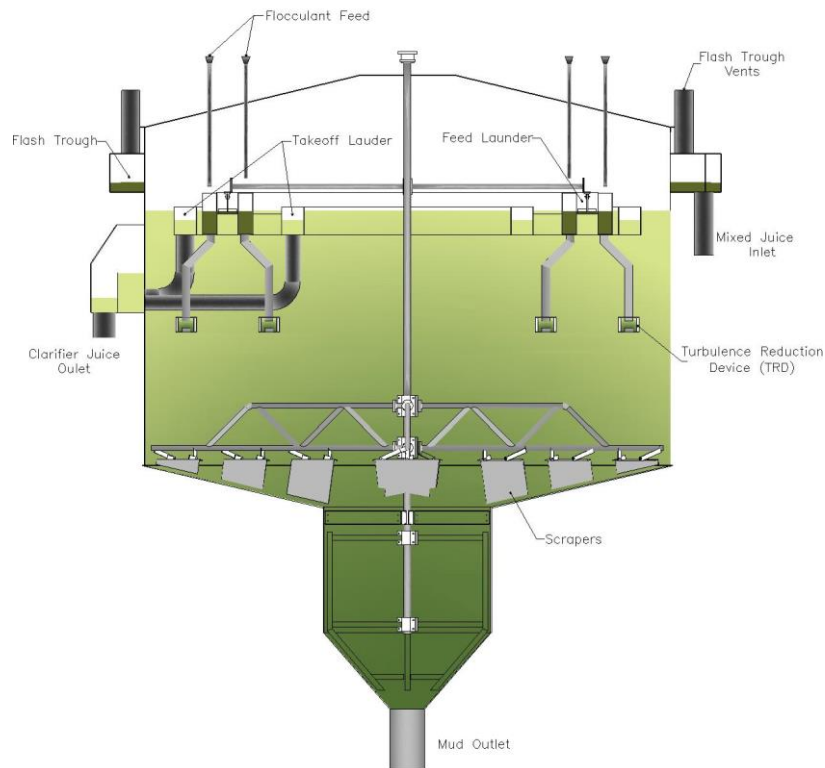


The TRD





The LLT Clarifier



LLT Clarifier With Flash Trough



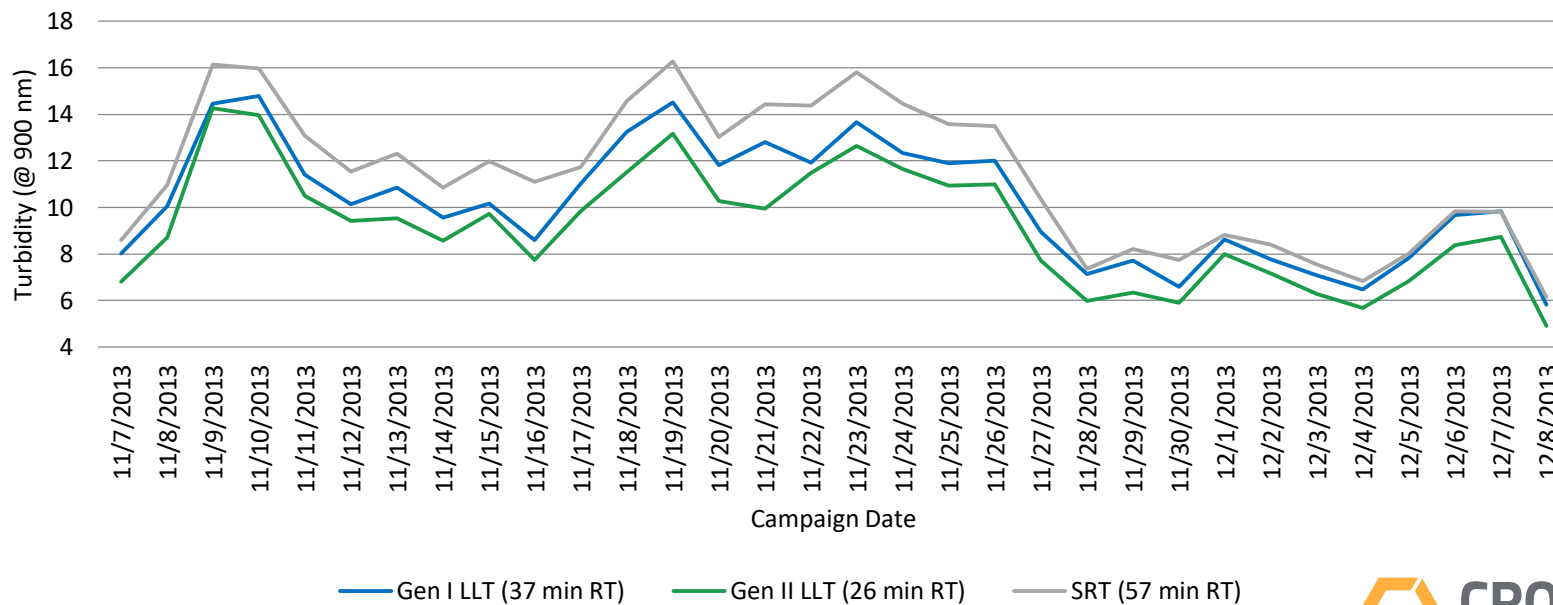
Sterling Sugars (Louisiana)





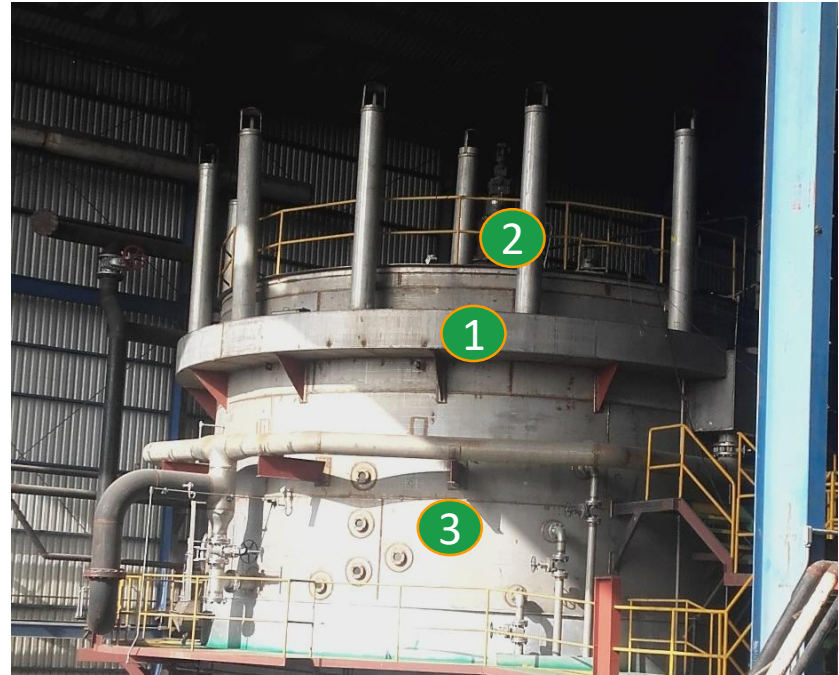
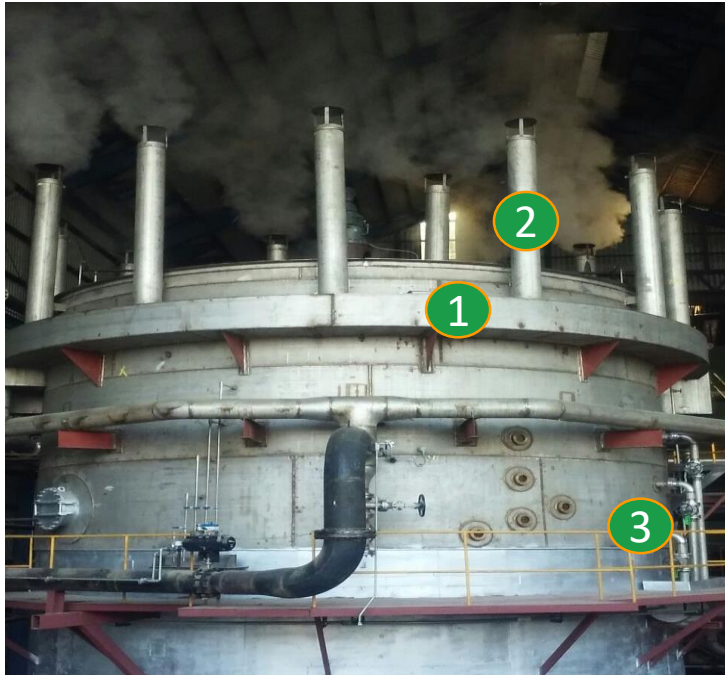
Sterling Sugars: Turbidity

2013-2014 Campaign Turbidity Profile





Ingenio Tululá (Guatemala)



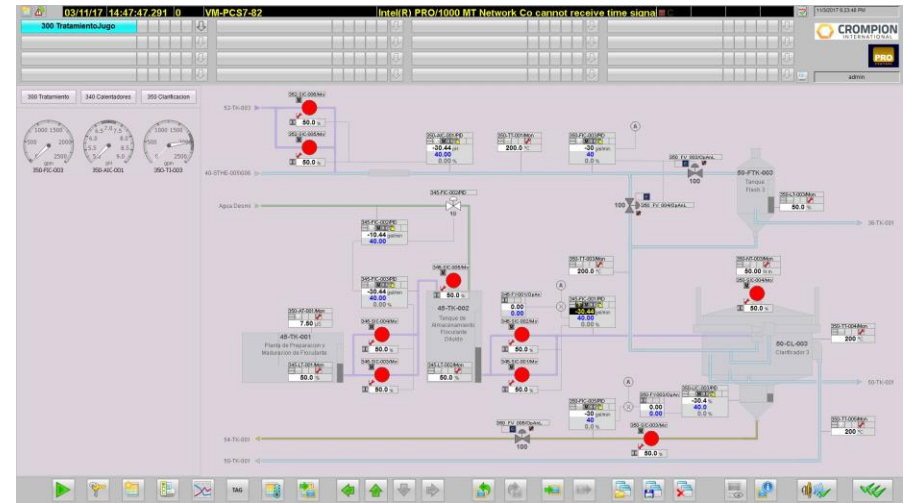
30 ft Diameter Crompton LLT Clarifier at Ingenio Tululá.
1) Flash Trough 2) Vents 3) Clarifier Body



Ingenio Tululá: Process Control

- To attain the best operation of the Crompion LLT Clarifier, we implemented the following control architecture at Ingenio Tululá:
 - Juice Flow Control
 - Temperature Control
 - pH Control
 - Flocculant Preparation and Dosing Control
 - Mud Withdrawal Control

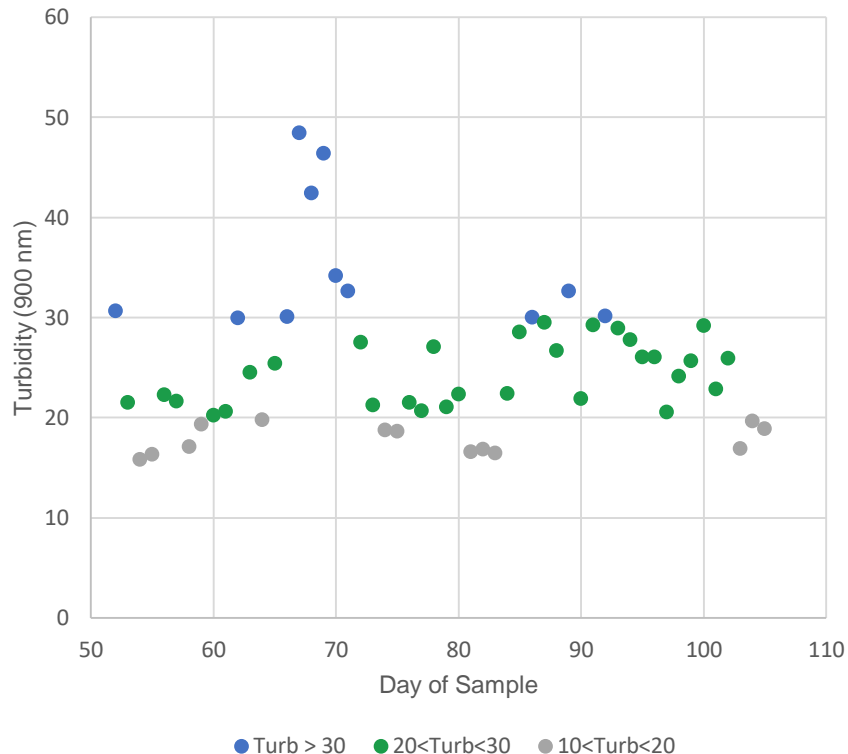
Process HMI





Ingenio Tululá: Turbidity

Turbidity Profile

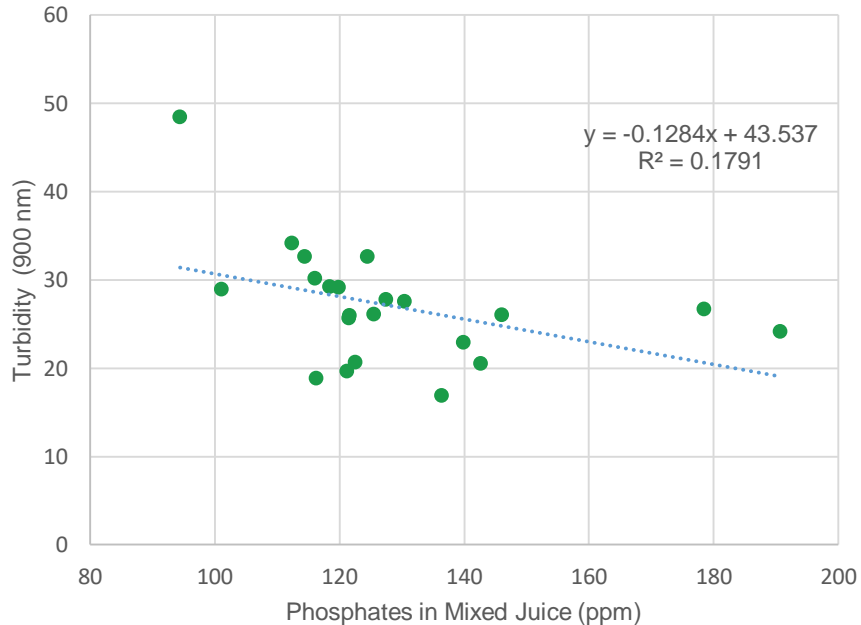


- The phosphates were low during the whole grinding season having a mean value of 128 ppm.
- This fact impacted the turbidity attained during the process. The average turbidity during the whole campaign was 21 IU, which can be considered acceptable.
- The sugar factory decided not to compensate with the addition of phosphoric acid to reduce costs.



Ingenio Tululá: Phosphates

Turbidity Vs. Phosphates

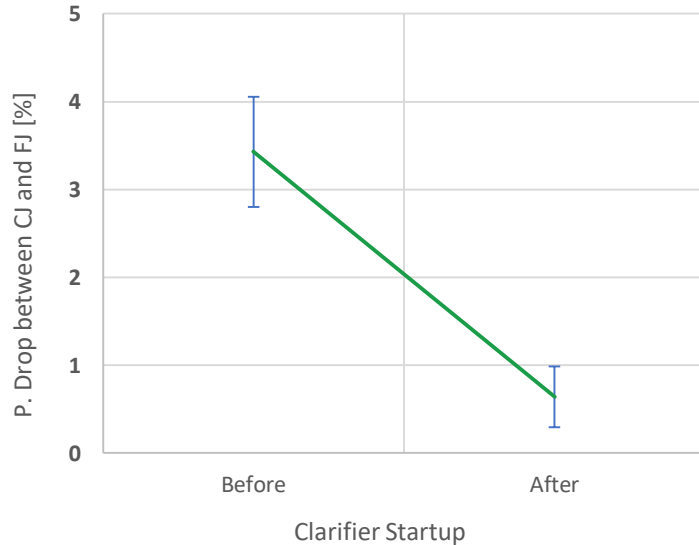


- An extrapolation of the data suggests that with a phosphate concentration of 260 ppm could lead to turbidities lower than 10 IU.
- We did not see any traces of Bagacillo or mud in the clear juice.
- Compared to the turbidities of the DORR Clarifiers, the quality of the juice attained in the LLT was significantly better.



Ingenio Tululá: Purity Drop

Purity Drop between CJ and FJ



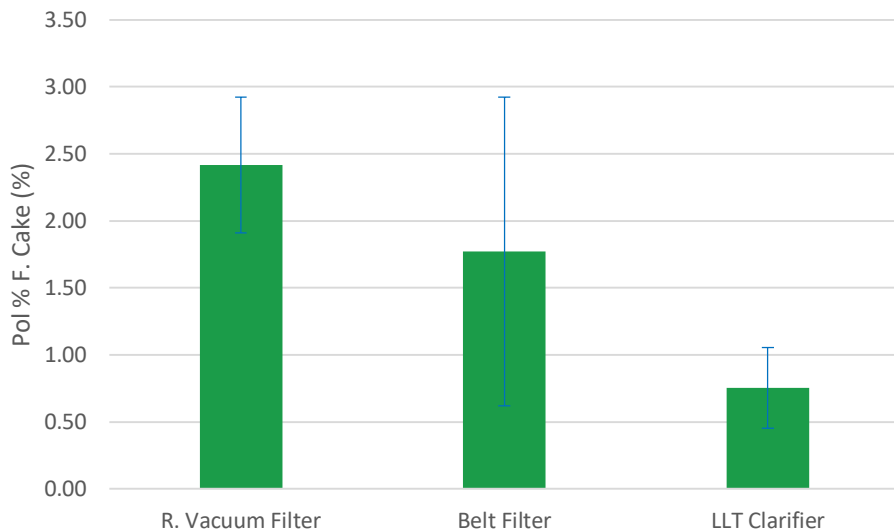
Effect	Mean	Std. Error	CI @ 95%	
P. Drop Before LLT	3.43	0.3118	2.8	4.07
P. Drop After LLT	0.64	0.1629	0.29	0.99

- The P. Drop between Clear Juice and Filtrate Juice is an indicator of the undetermined loss in the clarifier and filter stations.
- During the operation of the DORR Clarifiers, the average purity drop was 3.43%.
- After the startup of the LLT Clarifier, the purity drop decreased to 0.64%.
- We estimate that a reduction of 2.79 units has an impact on the BHR of approximately 0.6 units.



Ingenio Tululá: Pol % F. Cake

Pol % Filter Cake

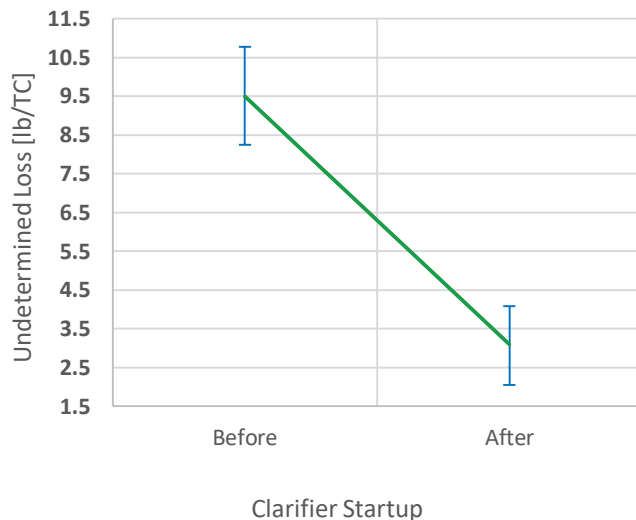


- The average value of Pol % F. Cake in the rotary vacuum filters was 2.42%.
- After the startup of the vacuum belt filter the Pol % F. Cake dropped to 1.77%.
- After the startup of the LLT Clarifier, the Pol % F. Cake dropped to 0.75%.
- Gravity and laminar flow were utilized to withdraw the mud from the clarifier
- The better floc produced by the LLT Clarifier reduced the resistance of the cake and improved its filterability.



Ingenio Tululá: Undetermined Loss

Undetermined Loss [lb/TC]

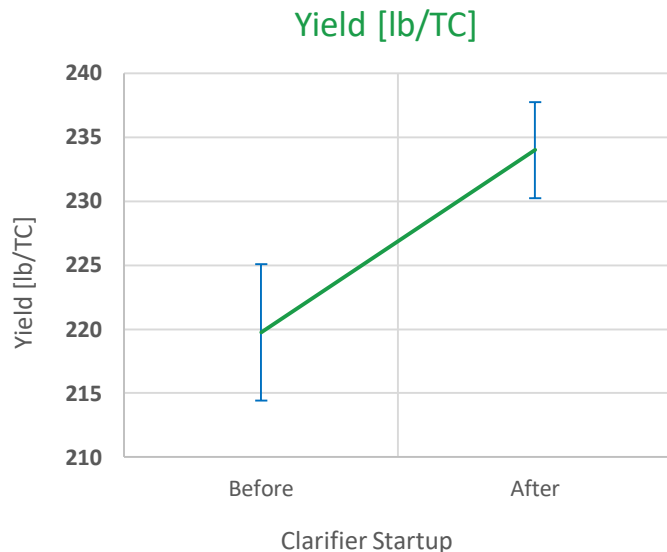


- Before the beginning of the operation of the LLT Clarifier, the factory reported an undetermined loss of approximately 9.5 lb/TC.
- After the clarifier was set in operation and until the end of the trial, the undetermined loss dropped to 3.1 lb/TC.
- We associate this results to the shorter retention time of the LLT Clarifier, and the reduction in the purity drop between the CJ and the FJ.

Effect	Mean	Std. Error	CI @ 95%	
U. Loss before the LLT	9.5	0.61	8.25	10.77
U. Loss after the LLT	3.1	0.48	2.05	4.09



Ingenio Tululá: Yield



- Before the beginning of the operation of the LLT Clarifier, the yield was on average 219.75 lb/TC.
- After the operation of the LLT Clarifier, we detected an increase of the factory's yield close to 233.98 lb/TC.
- The average yield increase after the operation of the LLT Clarifier has a mean value of 14.23 lb/TC.
- We found that these effects were statistically significantly different, which shows a positive impact of the LLT on the factory's operations.

Effect	Mean	Std. Error	CI @ 95%	
Yield before LLT Clarifier	219.75	2.64	214.43	225.07
Yield after LLT Clarifier	233.98	1.87	230.21	237.74



Mud Filtrate Clarification

- Some sugar factories implemented mud filtrate clarification in the past. However, it was not widely adopted.
- We have revisited mud filtrate clarification with the LLT Clarifier Technology achieving retention times of up to 10 minutes.
- Achieved up to 95% suspended solids removal.
- Turbidities in clear juice oscillated between 10-20 IU @ 900 nm.
- Color removal ranged from 16 to 20%.





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Thanks