FP2:

AN INNOVATIVE PROCESS FOR PLANTATION-WHITE SUGAR OF ULTRA-LOW SO2 CONTENT

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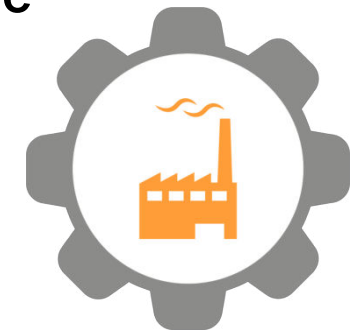
BACKGROUND

- Demand of domestic market of Sudan is for white sugar of 100 ICUMSA of negligible SO2 content i.e. less than 10 ppm.
- Most of the factories in Sudan including the 25000 TCD capacity Kenana Sugar, produce white sugar of 100 ICUMSA by Defco-remelt phosphotation (DRP) process with following parameters:
  - Higher chemical consumption.
  - Higher steam consumption at level of 60 % on cane
  - Higher power consumption of process house more than 12 kW/t of cane.



STUDY OBJECTIVE

- White Nile Sugar Company (WNSC) from Sudan, while setting up a green field 24000 TCD capacity sugar plant, set the target to produce 100 ICUMSA white sugar having less than 10 ppm sulphur content with following prime objectives:

- Minimum capital cost

- Minimum requirement of bulk chemicals viz lime and sulphur, that are not locally available in Sudan and expensive to import.

- Minimum process energy requirement

SCHEME TO ACHIEVE THE OBJECTIVE

In order to circumvent these limitation, a process was developed, which eliminates the intermediate stage of raw sugar melting, yet limit the SO2 content in sugar, to reduce :

- The capital cost
- Process steam and power consumption.
- Bulk chemicals i.e. lime and sulphur

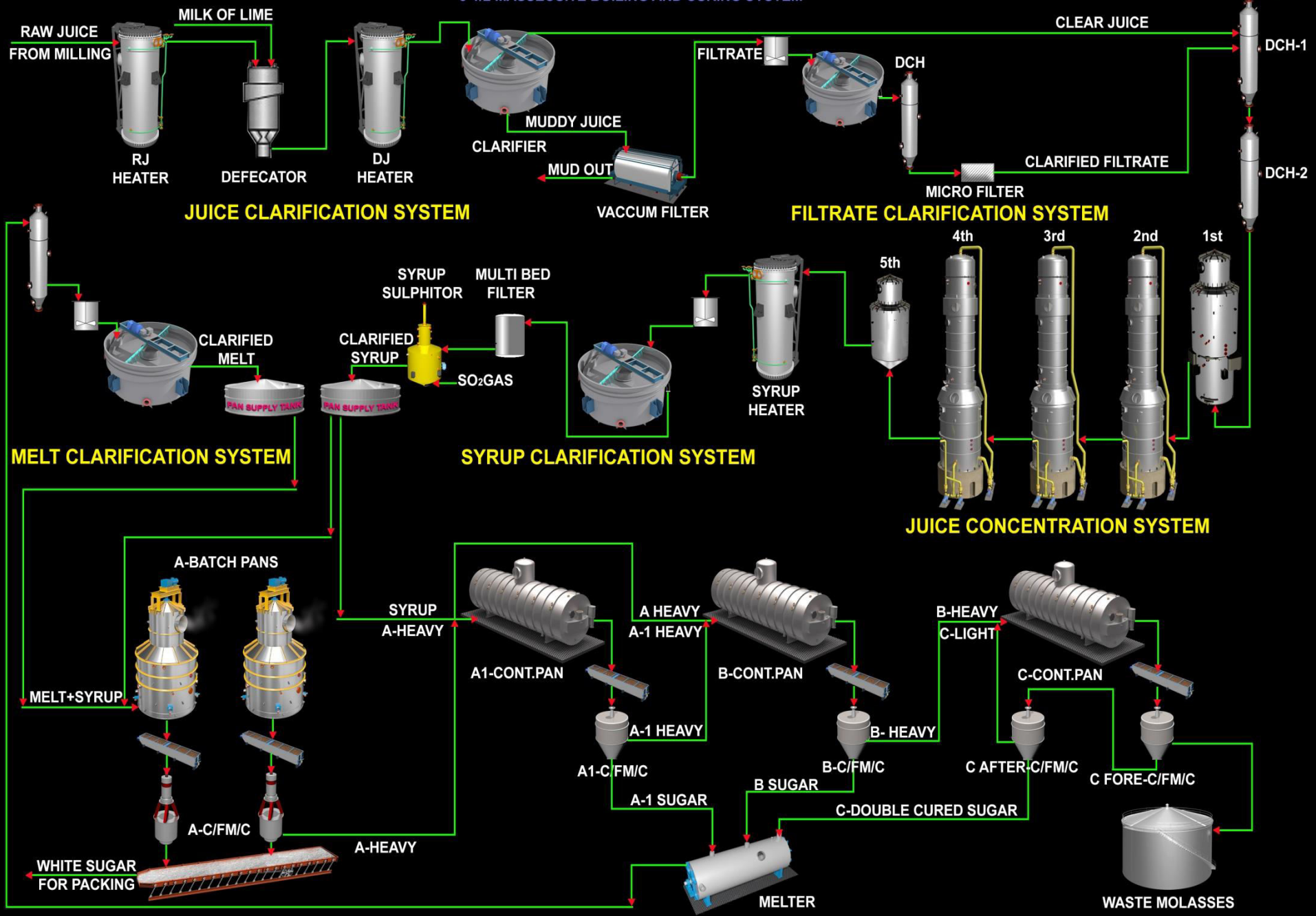
Named as 'S-Pro Isgec' Process.

Successfully adopted in 24,000 TCD sugar plant at WNSC Sudan.

PROCESS FLOW DIAGRAM:PLANTATION WHITE SUGAR OF ULTRA LOW SO2 CONTENT

ISGEC

3-1/2 MASSECUITE BOILING AND CURING SYSTEM



‘S-Pro Isgec’ PROCESS

- Raw juice is clarified by hot liming to 7.7 pH followed by settling in a continuous clarifier. Clear juice is concentrated in quintuple effect evap. to 67° Bx, called raw syrup.

- Clarifier underflow is clarified by phospho-flotation followed by micro-filtration. The clear filtrate is directly sent to evaporator along with clear juice.

- The scum from syrup clarification & melt clarification is de-sweetened through filtrate clarification system.

‘S-Pro Isgec’ PROCESS

- Raw syrup is clarified with phospho-flotation followed by deep bed filtration then lightly sulphited to 5.7 pH.
- 3½ massecuite boiling incorporating an intermediate A1-massecuite.
- A1-massecuite is boiled in continuous pans. Its purity and quantity is adjusted to maintain melt color below 3000 IU. The A1 grain is prepared in clarified syrup using seed slurry.
- About 70% of the total feed to the A1 continuous pan is clarified syrup and 30 % is A heavy molasses.

‘A’ PAN STATION AT WNSC

‘S-Pro Isgec’ PROCESS

- Whenever the purity of B-massecuite goes up, footing ratio is changed i.e. then grain is made in 50 % syrup and 50 % A heavy molasses.

- A1 single-cured sugar, B single-cured sugar and C double-cured sugar are melted. The melt is clarified with phospho-flotation process.

- A-massecuite footing is done by clarified melt and then filling by clarified syrup. It is then centrifuged to get 100 IU white sugar with negligible SO2 content i.e.<10 ppm.

- B and C massecuites are boiled in continuous pans as per normal procedure.

‘A1’, ‘B’ AND ‘C’ PAN STATION AT WNSC

DETAILS OF EVAPORATORS AT WNSC

Clear juice is heated to 118°C and then concentrated to 67±1° Bx in 5-effect evaporator set consisting of:

1st Effect
(4w+1s) x 3380 m2, Semi-Kestner

2nd Effect
(4w+1s) x 3340 m2, Falling Film

3rd Effect
(4w+1s) x 3340 m2, Falling Film

4th Effect
(4w+1s) x 1200 m2, Falling Film

5th Effect
(4w+1s) x 1000 m2, Robert type

EVAPORATOR STATION AT WNSC SUDAN

OPERATING DATA

- The S-pro Isgec process has been adopted in the 24,000 TCD sugar plant of WNSC, Sudan.
- Plant has 4 streams, each of 6000 TCD. Each stream has been successfully commissioned.
- Plant has regularly produced plantation white sugar of 100 ICUMSA with less than 10 ppm SO2.
- About 1.0 kg lime & 2 kg sulphur is consumed per tonne cane. Small quantities of fine chemicals were also consumed for phospho-flotation.

PERFORMANCE TEST

RESULTS AT WNSC

- The performance test of one stream of the process plant, i.e. at 6000 tonnes of cane per day capacity, was conducted for a continuous period of 3 days from 16-18 February 2015.

- The average results of these 3 days in respect of analysis of intermediate products, sugar quality, color balance and heat and mass balances are given on next slides.

PG TEST RESULTS:

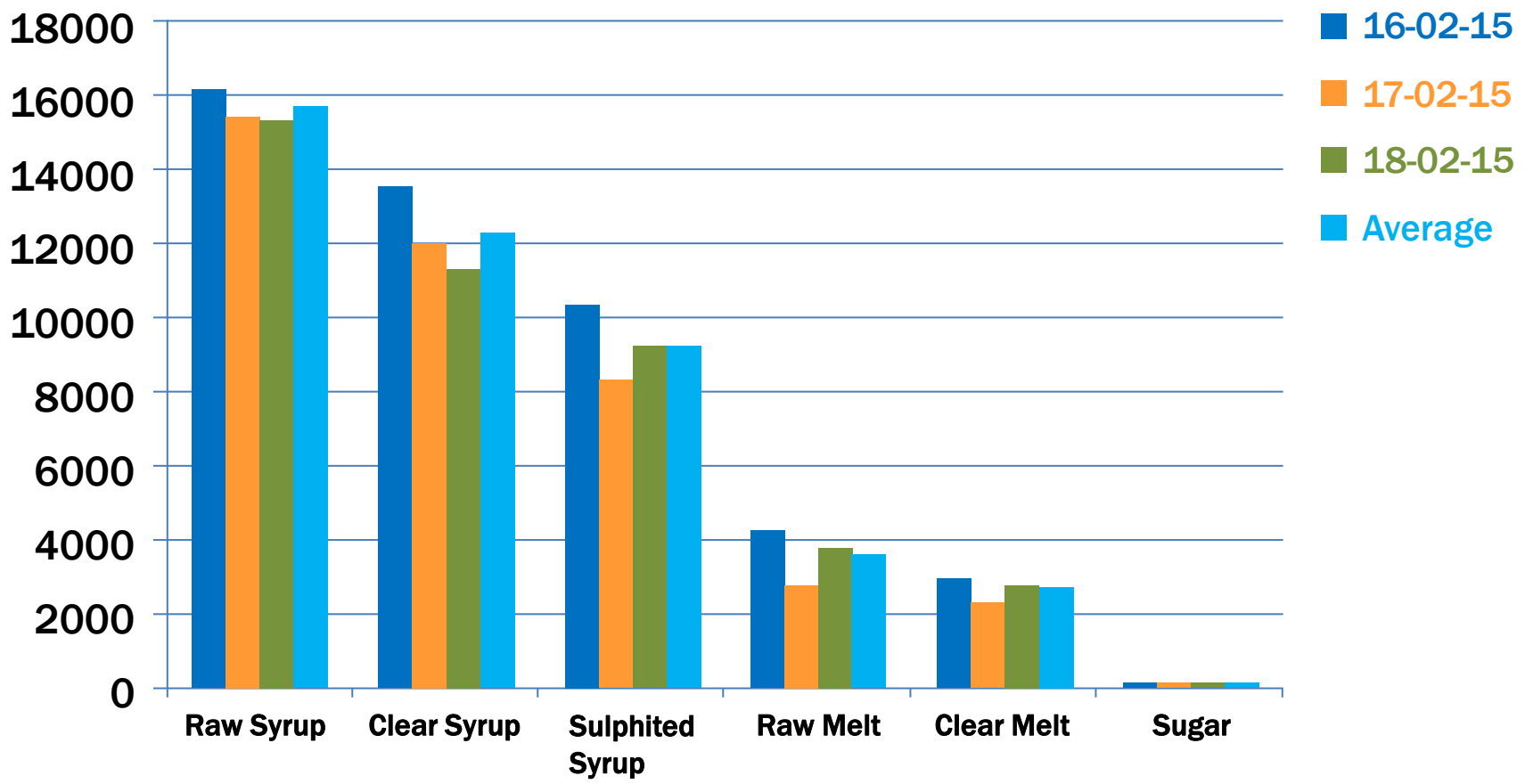
BRIX / POL / PURITY

Stage	Brix (°Bx)	Pol (%)	Purity (%)
Raw syrup	67.12	55.19	82.23
A massecuite	89.77	79.67	88.75
A1 massecuite	92.71	74.25	80.09
B massecuite	92.53	69.67	75.29
C massecuite	96.12	55.24	57.47
Raw melt	65.00	62.33	95.89

Pol / Brix by method 6.1 of SASTA laboratory manual.
Figures are average of 3 days i.e. 16-18 Feb 2015.

PG TEST RESULTS:

COLOUR PROFILE



PG TEST RESULTS:

FINAL SUGAR ANALYSIS

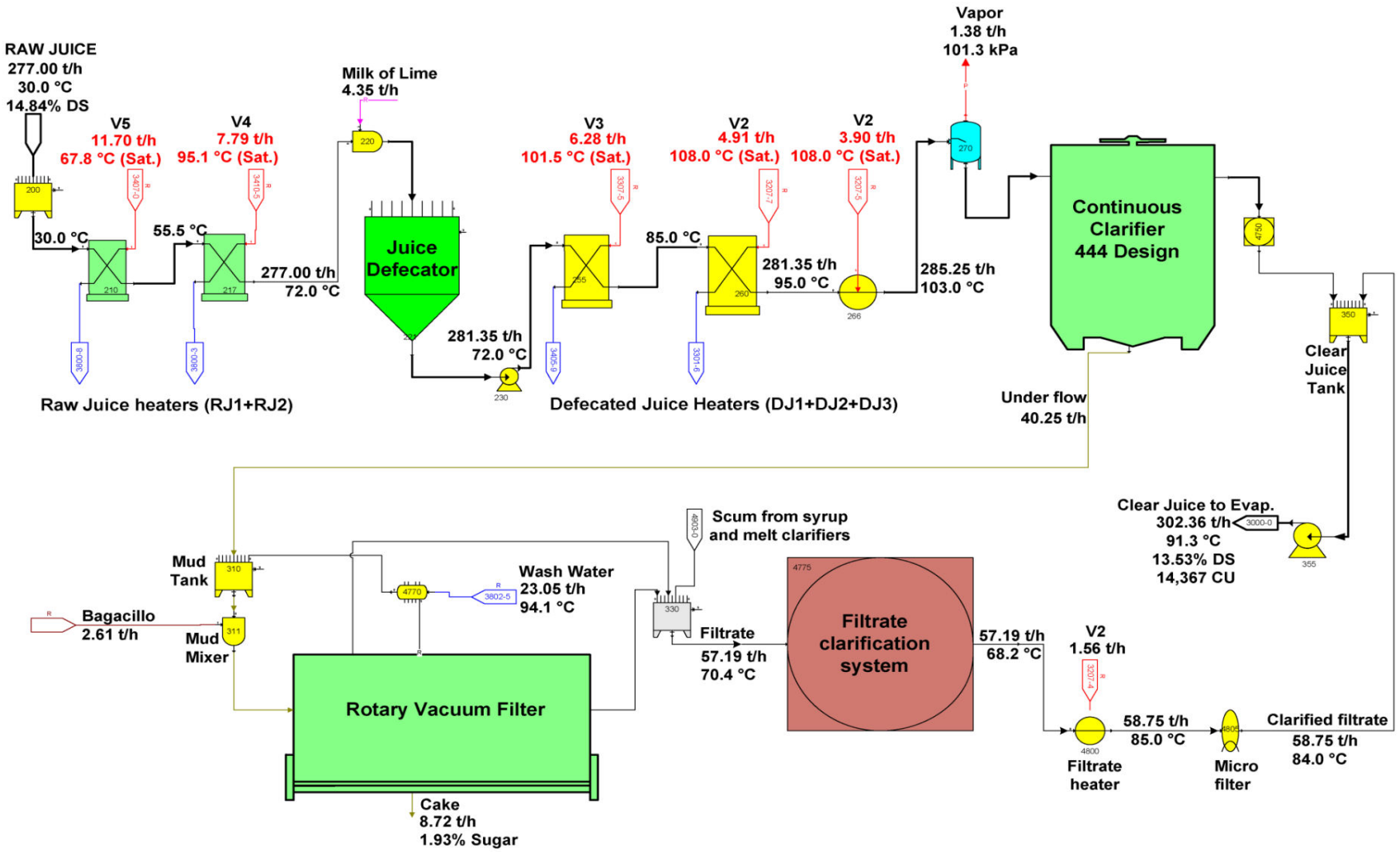
Date	Colour	SO2 Content
16 Feb, 2015	98 IU	9.0 ppm
17 Feb, 2015	96 IU	7.0 ppm
18 Feb, 2015	101 IU	8.0 ppm

ICUMSA method GS9/1/2/3-8 (2011) used for color.

ICUMSA method GS2/1/7/9-33 (2011) used for SO2

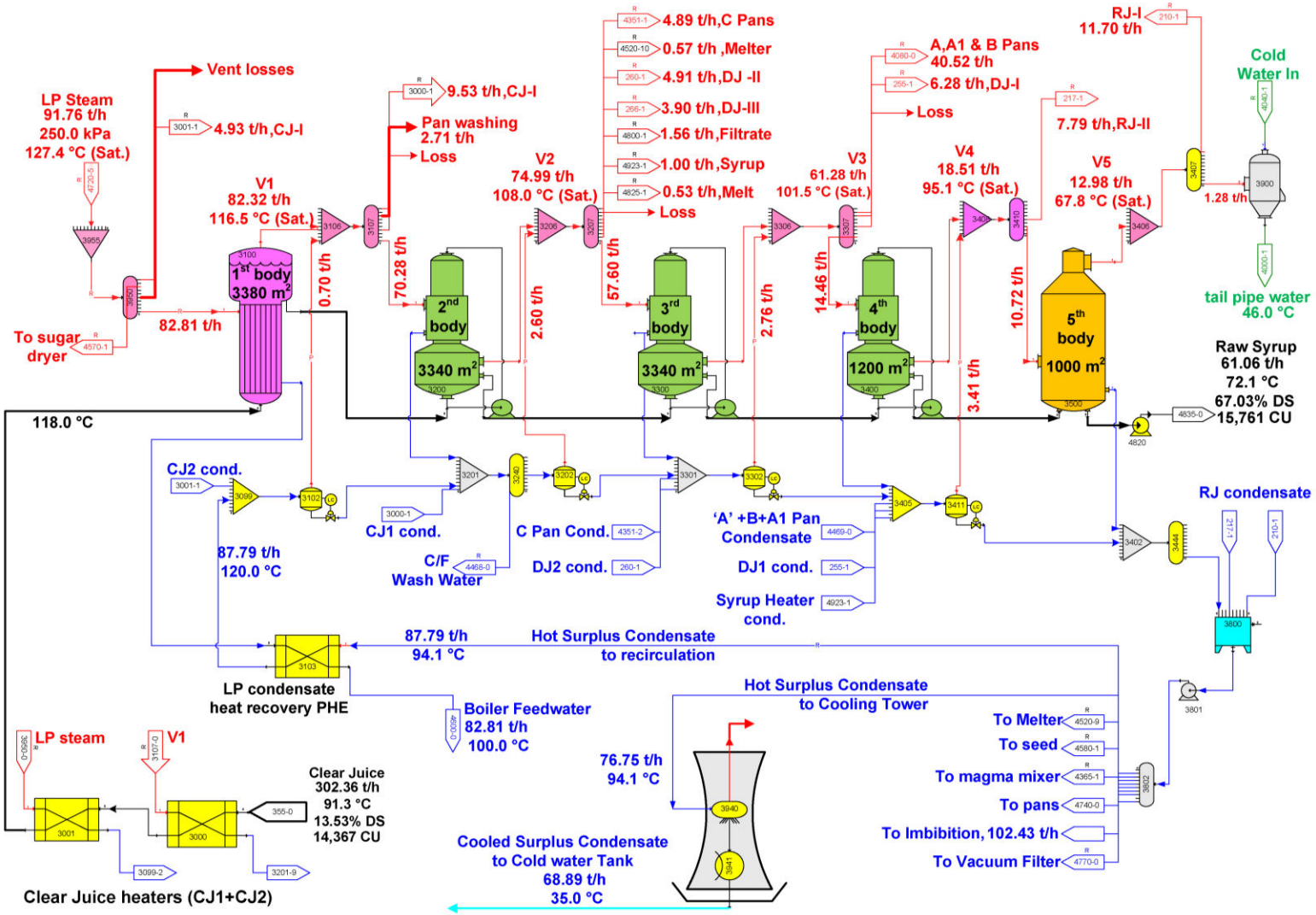
HMBD FOR PG TEST PERIOD:

JUICE CLARIFICATION



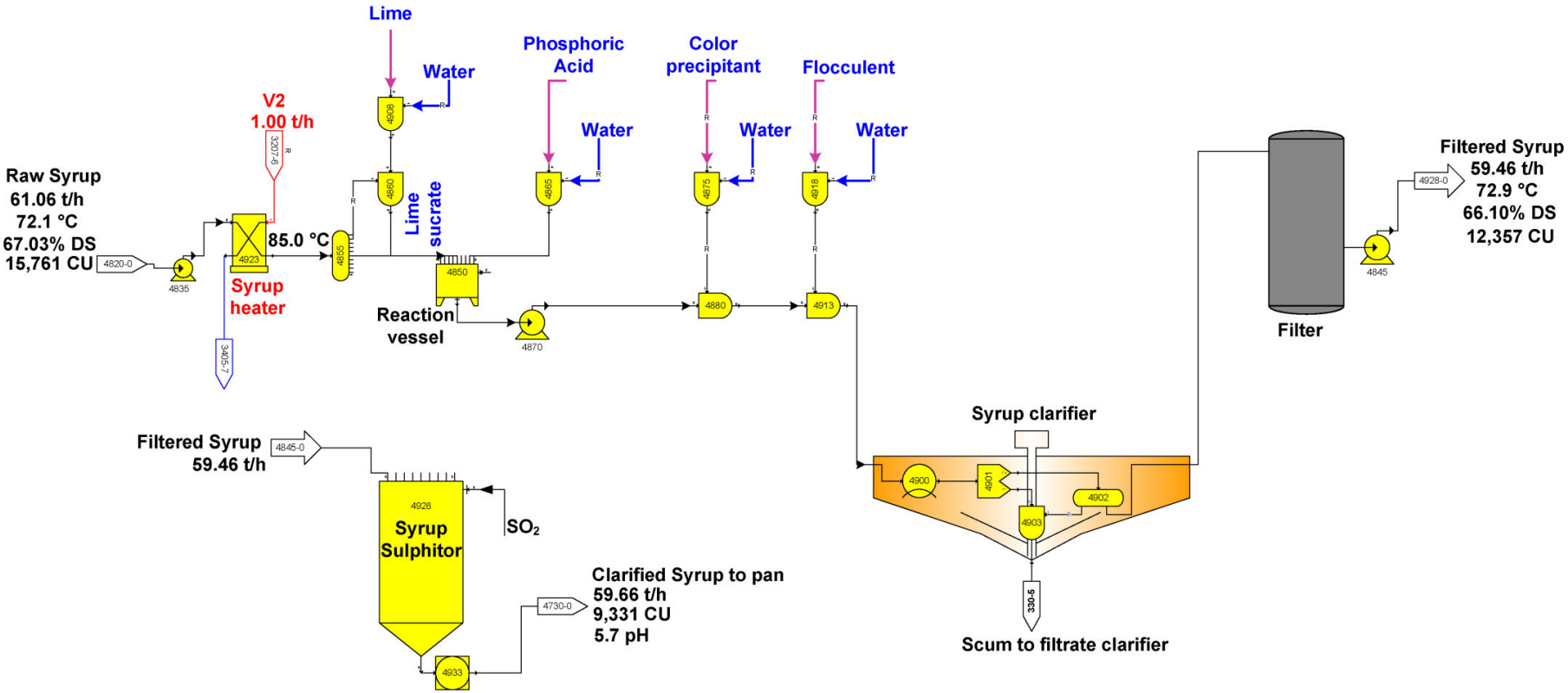
HMBD FOR PG TEST PERIOD:

EVAPORATOR SECTION



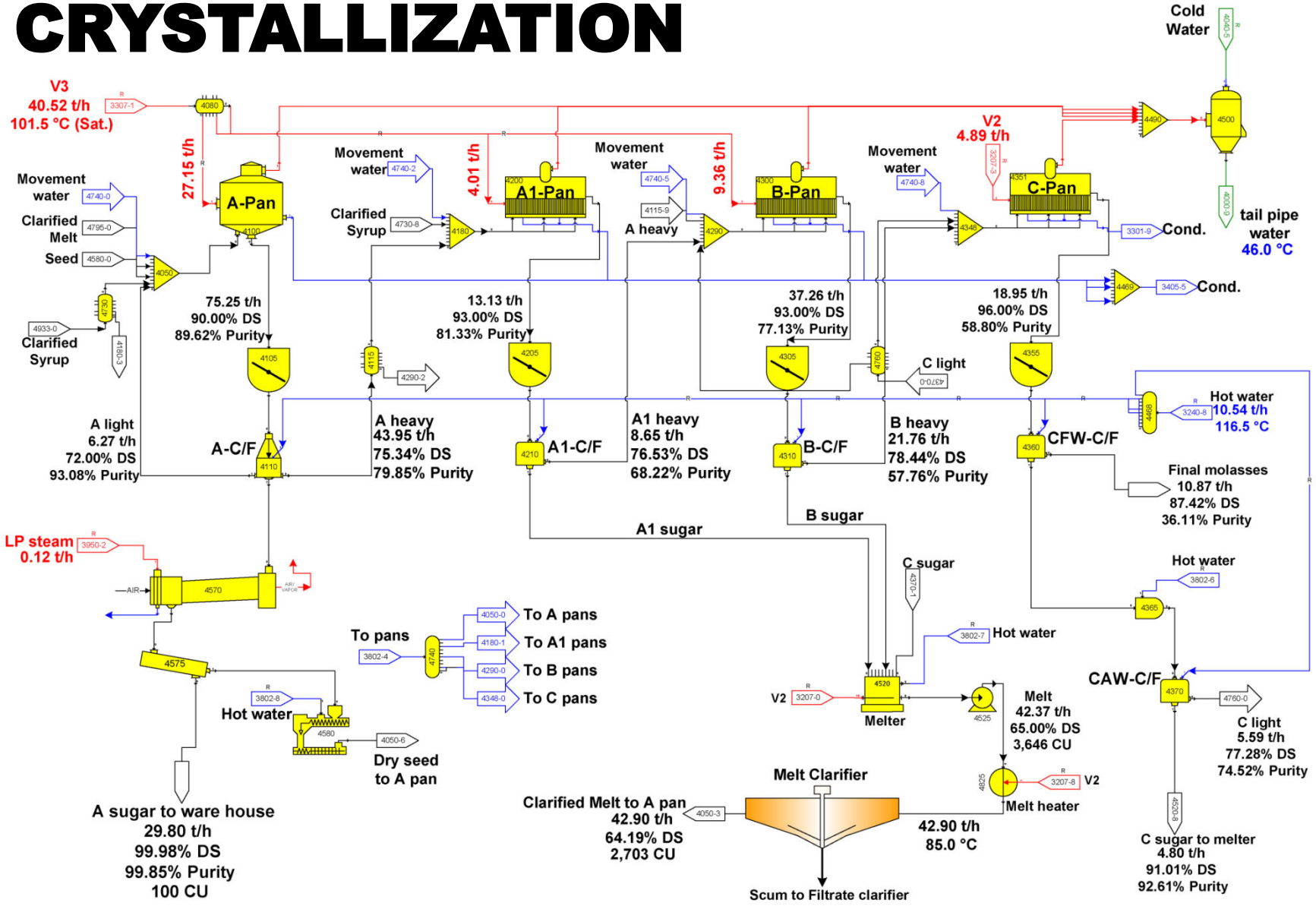
HMBD FOR PG TEST PERIOD:

SYRUP CLARIFICATION



HMBD FOR PG TEST PERIOD:

CRYSTALLIZATION



ENERGY CONSUMPTION: DIFFERENT PROCESSES

Parameter	S-Pro ISGEC Process	Double sulphitation	DRP process
Steam consumption	33.5% on mixed juice	34% on mixed juice	37% on mixed juice
Power consumption	8.5 kW/t cane	9.0 kW/t cane	10.0 kW/t cane

CONCLUSION

- S-Pro Isgec Process is simple and reliable. It has lower capital, operation and maintenance costs as compared to any other process for producing white sugar.

- It consumes 50% less lime, 5% less steam on cane and 10% less power consumption as compared DRP process to produce white sugar of 100 ICUMSA.

- It results in softer scale in juice heater and evaporator tubes that can be removed by CIP (chemical cleaning) during the season, thus avoiding the need for expensive and time consuming mechanical de-scaling.

Thank You

Presented By

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