



# How two additional falling film evaporators save steam in a cane sugar factory

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Without verbal explanation the information on this document is incomplete

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# Introduction



- ***Cane sugar factory Indian Cane Power Ltd. (ICPL) / India feeds electrical power to local grid with considerable economic benefits***
- ***Objective: Increase the power yield by minimising specific steam consumption***
- ***ICPL is attempting to increase their co-generation proceeds by employing new technologies in plantation white sugar production and gaining surplus electricity from bagasse***



# Configuration Season 2012/13



## ■ ***5-effect falling film evaporation plant*** designed for 7000 tcd

- FFE1 – 4000 m<sup>2</sup>
- FFE2 – 4000 m<sup>2</sup>
- FFE3 – 4000 m<sup>2</sup>
- FFE4 – 1000 m<sup>2</sup>
- FFE5 – 1000 m<sup>2</sup>

## ■ ***3<sup>rd</sup> (and 2<sup>nd</sup>) vapour used for crystallisation***

## ■ ***Continuously operating vacuum pans for B- and C-product***

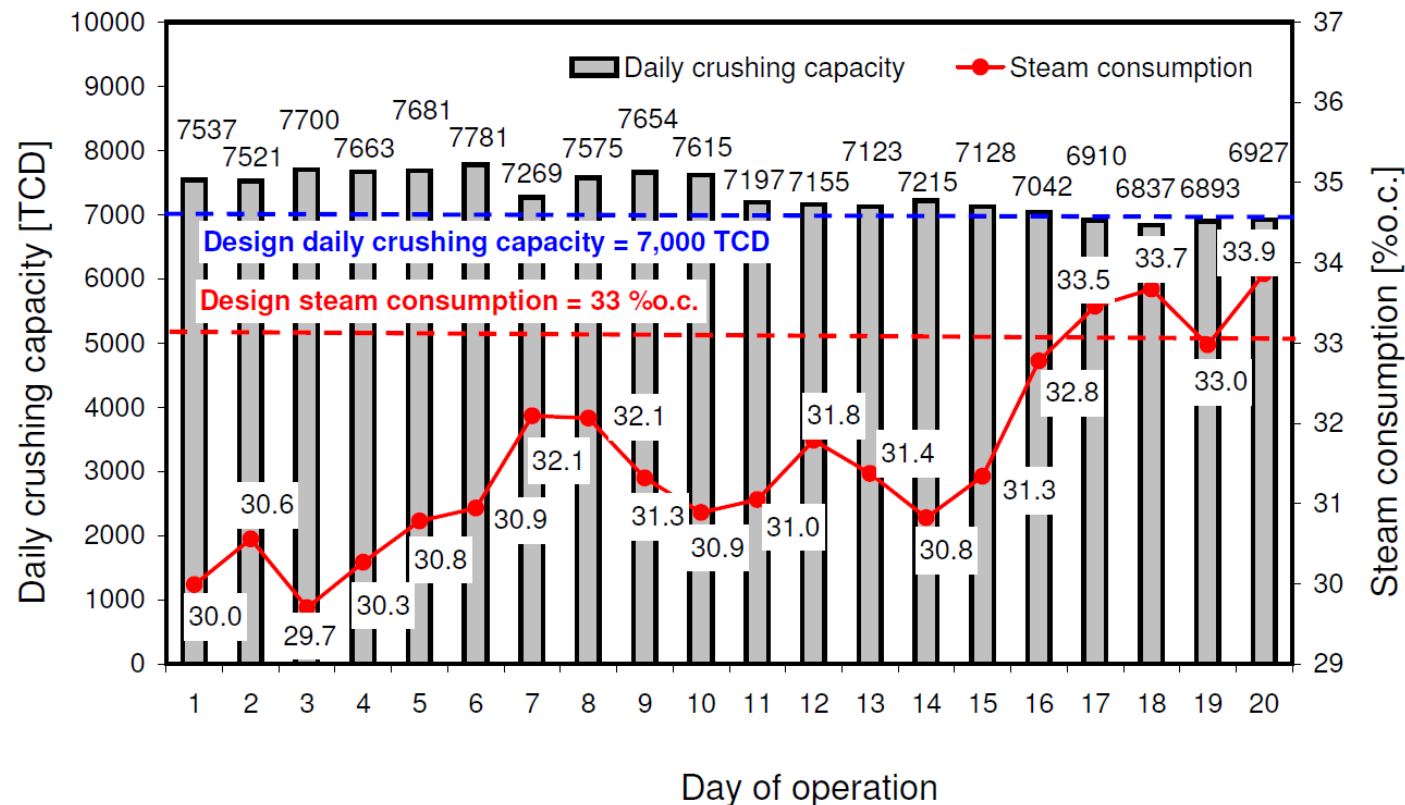


# Operating figures Season 2012/13



## ■ Operating figures

- Depending on scales on heating surfaces
- Crushing capacity 7000 to 7700 tcd
- Specific steam consumption 30 to 33 % o.c.





# New Configuration Season 2013/14



- *Two new BMA falling film evaporators were added before season 2013/14*

- **2 x 4000 m<sup>2</sup>**

- *Updated 5-effect falling film evaporation plant*

- FFE1 – 4000 m<sup>2</sup>
- FFE2 – 4000 m<sup>2</sup>
- FFE3 – 4000 m<sup>2</sup>
- **FFE4 – 4000 m<sup>2</sup>**
- FFE5 – 1000 m<sup>2</sup>
  
- Spare bodies for cleaning
  - 1x 4000 m<sup>2</sup>: FFE3 and FFE4**
  - 1x 1000 m<sup>2</sup>: FFE5 (former FFE4)



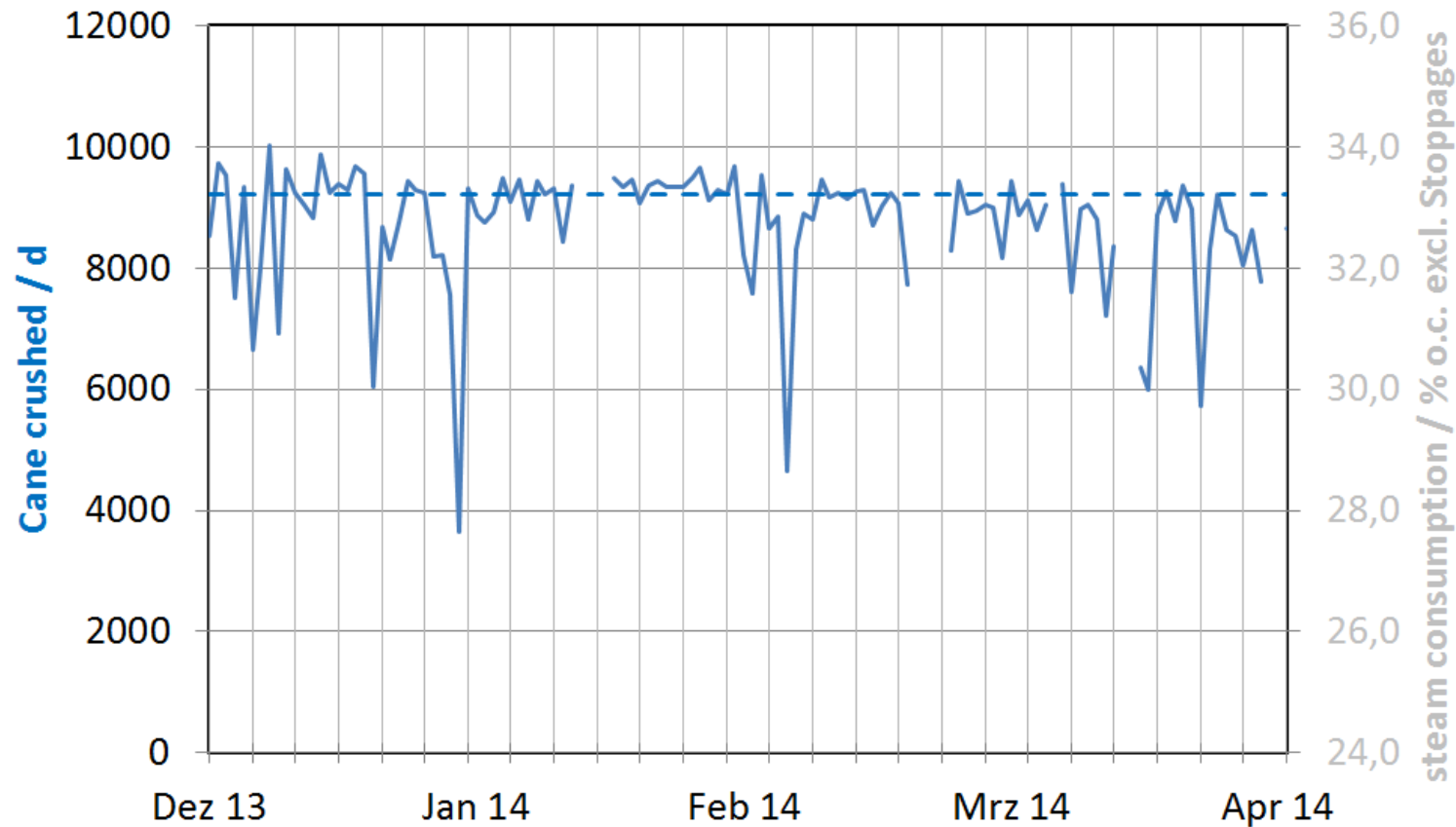
# Operating figures



## ■ Season 2013/14

● Cane crushing (average without stoppages)

**9200 tcd**

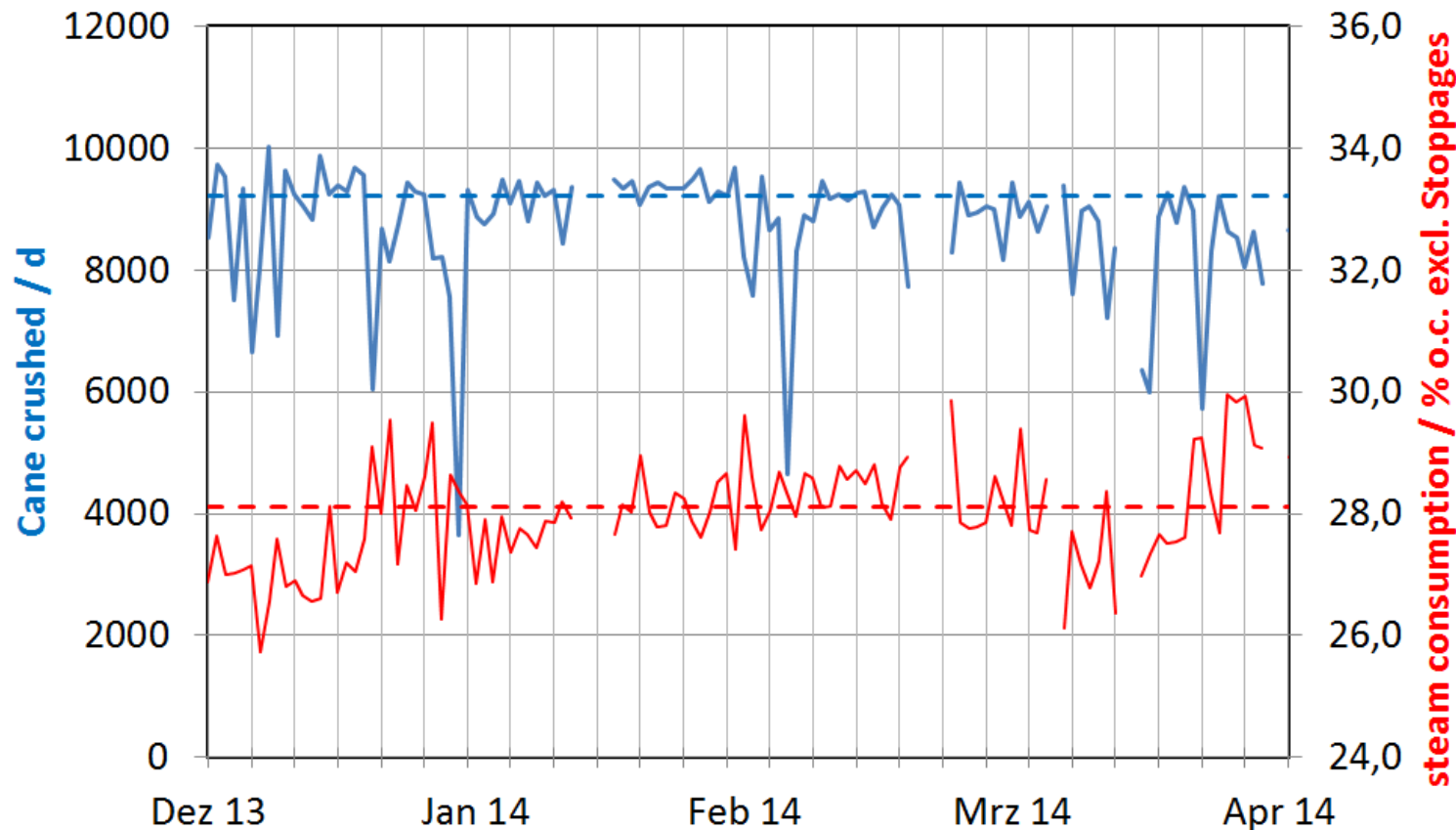


# Operating figures



## ■ Season 2013/14

- Cane crushing (average without stoppages) **9200 tcd**
- Steam consumption (average without stoppages) **28.1 % o.c.**  
(with clean heating surfaces of evaporators down to 27 % o.c.)





# Operating figures



## ■ *Season 2013/14*

- Cane crushing (average without stoppages) **9200 tcd**
- Steam consumption (average without stoppages) **28.1 % o.c.**

## ■ *Cleaning of evaporators in season 2013/14*

- 1<sup>st</sup> and 2<sup>nd</sup> effect: up to 40 days of operation
- 3<sup>rd</sup> and 4<sup>th</sup> effect: up to 20 days of operation
- 5<sup>th</sup> effect: each 10 days of operation

## ■ *Comparison to the season 2012/13*

- Steam production remaining at average 104 t/h (maximum 110 t/h)
- Increased steam efficiency from 30 to 33 % o.c. to 28.1 % o.c.
- Increased crushing capacity by approx. 30 %
- Surplus bagasse is used for power production during off-season

***Is it only due to the installation of 2 new evaporators?***

# Why this low steam % o.c.?



- ***Not only the installation of two new falling film evaporators, additional measures for boiling sugar were realised***

- ***A-pans with powerful agitators***

- Excellent circulation
- High heat transfer
- Working with 3<sup>rd</sup> vapour and even with 4<sup>th</sup> vapour possible



- ***Separate syrup concentrator on 4<sup>th</sup> vapour***

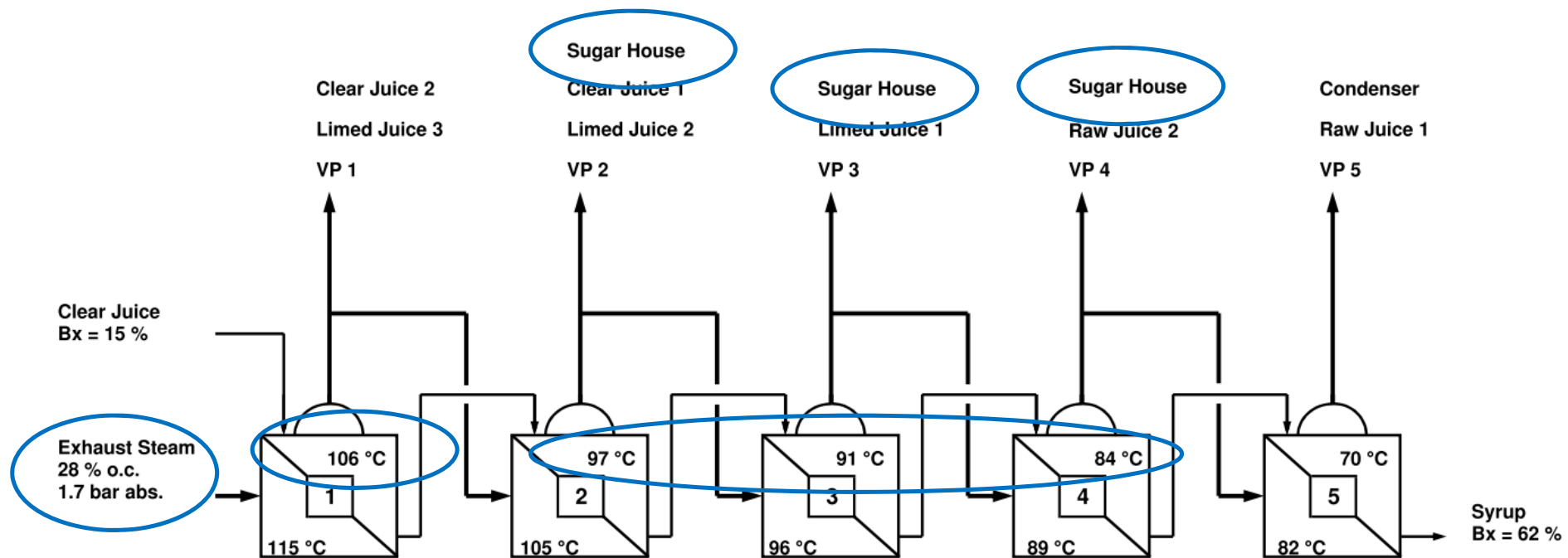
- ***Non-condensables from pans are directed to condenser***

- Full steam/vapour system is operating under vacuum
- Heating of continuous pans became more stable
- Less water addition to boiling

# Why this low steam % o.c.?



- **Bleeding of 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> vapours to sugar house at low temperatures**
  - 2<sup>nd</sup> – 3<sup>rd</sup> - 4<sup>th</sup> vapour: 97 °C – 91 °C – 84 °C
- **Low temperature of 1<sup>st</sup> effect results in low heating demand for clear juice**
- **Steam requirement 28 % o. c. at 1.7 bar abs. / 115 °C**



# Conclusion



- ***5-effect falling film evaporator plant and sugar boiling with 4<sup>th</sup>, 3<sup>rd</sup> and 2<sup>nd</sup> vapour shows reliable operation with 28 % o.c. steam demand (seasons average without stoppages) and helps maximising electric power generation***
  
- ***High heating surface in 4<sup>th</sup> effect is a mandatory to bleed a respectable quantity of vapour for sugar boiling***
  
- ***Equipment of sugar boiling must be able to work at low heating temperatures***
  - Powerful agitator reduce necessary temperature difference
  - Tight steam and vapour system to work at vacuum (low quantity of non-condensable gases, NCGs conducted to condenser)
  - Increased syrup brix for feed to A-boiling (syrup concentrator)
  
- ***Low 1<sup>st</sup> vapour temperature reduces heating requirement for clear juice***



*Passion  
for  
Progress*



**Thank you for your attention**

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