

An Updated Review of the Combined Stabilisation System

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INTRODUCTION

A Handtmann Combined Stabilisation System (CSS) was commissioned at the Castlemaine Perkins Brewery in Brisbane in May 2009. The CSS unit utilises stable agarose beads with active sites to remove polyphenols and sensitive proteins from the filtered beer, to reduce colloidal haze formation in finished product. An initial review was presented at the 2010 Asia Pacific Convention, and this study reviews the longer term quality performance of the unit since commissioning.

The CSS unit was modified after initial installation to install a Handtmann Carbonization unit for increasing the Deaerated liquor carbonation from approx. 3.5 → 5.0 g/L. This was to enable the replacement Cl⁻ (from Sodium chloride) with HCO₃⁻ as a counter ion for the removal of protein during regeneration. This change has proven effective and has reduced operating costs through the removal of Sodium chloride brine deliveries.

The Castlemaine Perkins CSS unit is shown in Picture 1, and the adsorber mechanism for removal of polyphenols and protein is shown in Diagram 1.

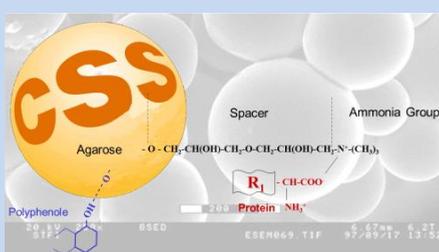
Picture 1

Castlemaine Perkins CSS Units (x3)



Diagram 1

CSS Adsorber Mechanism¹



METHODS

- 1. Packaged Haze Measurement (0 Week Haze).** Turbidity analyses were carried out on beer stored at 0°C for 24 hour with the use of a Voss Rota 90 Haze Meter, and measured in EBC formazin units.
- 2. 13 & 39 Week Packaged Haze.** 13 & 39 weeks storage at 22°C, followed by 24 hours at 0°C. Haze measurement then taken at 0°C as described above for Packaged Haze Measurement.
- 3. Total Polyphenols.** Analysis carried out as per EBC-Analytica method 9.11².

RESULTS AND DISCUSSION

Five major beer brands produced at the brewery were compared for haze over a 15 month period commencing 1st Jan 2014. This allowed comparison of the most recent 39W haze data with both the 0W and 13W haze data for the same period. These results along with relevant product information are shown in Table 1.

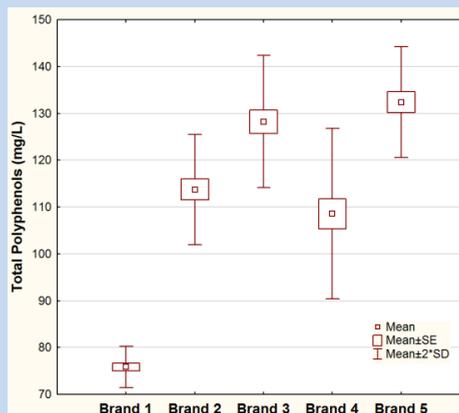
Table 1 Product Information & Haze Results

Brand	OE (°P)	Yeast Strain	Mean Haze – 0 Week (°EBC)	Mean Haze – 13 Week (°EBC)	Mean Haze – 39 Week (°EBC)
Brand 1	6.8	A	0.23	0.37	1.12
Brand 2	10.2	A	0.40	0.91	2.02
Brand 3	10.5	A	0.44	0.84	2.21
Brand 4	8.1	B	0.54	1.04	2.48
Brand 5	10.1	B	0.66	2.09	4.75

The haze results in Table 1 show that except for Brand 5 the hazes have been effectively managed during this period for a product 9 month shelf life. The Yeast Strain B used for brewing Brands 4 & 5 is known to produce higher hazes than other yeast strains.

In general, brands with higher original extract will also have higher levels of polyphenols and sensitive proteins, so they will require a higher level of stabilisation through the CSS unit to achieve a similar shelf life. The polyphenol levels in the final beer were also analysed for this period, and are shown in Graph 1 and Table 2.

Graph 1 Box Plot of Total Polyphenols



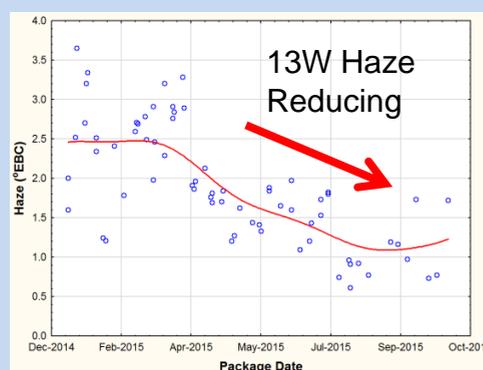
To reduce the haze levels on Brand 5 due to the higher polyphenols and known yeast strain impact, the stabilisation through the CSS was progressively increased for this brand in 2015, as shown in Table 2.

The positive impact of this change is shown in Graph 2 for 13W hazes, and has brought this brand into specification for haze.

Table 2 Mean Polyphenols and Nominal Polyphenol Settings

Brand	Mean Total Polyphenols (mg/L)	Nominal CSS % reduction 'settings' for Polyphenols (mg/L)
Brand 1	75.8	22.2
Brand 2	113.7	33.4
Brand 3	128.2	35.5
Brand 4	108.6	34.4
Brand 5	132.2	40.5 → 48.5

Graph 2 Scatter Plot of 13 Week Haze – Brand 5



AGAROSE MATERIAL COSTS

Since the unit was commissioned the product hazes have been monitored to ensure that the CSS unit was functioning effectively, and at the time of writing this paper there has been no need to request a changeover of the agarose material by Handtmann. This has resulted in an agarose material cost (at current price) of 0.023 €/hL of beer packaged since commissioning until Dec 2015, and the agarose material is still performing to duty.

SUMMARY

- The Handtmann CSS unit has proved an effective stabilisation system, without a change in the agarose adsorber for a time period approaching 7 years.
- One product has presented higher haze results due to the yeast strain used and also a higher level of polyphenols, but when the stabilisation was increased the stability haze was effectively managed.
- The change from Sodium chloride to Deaerated Liquor for removal of protein during regeneration of the agarose was successful.

REFERENCES

1. Handtmann presentation to Lion 2011
2. Analytica-EBC 9.11 Total Polyphenols in Beer by Spectrophotometry. June 2005

ACKNOWLEDGEMENTS

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2. Axel Jany of Handtmann for his support and review of the work