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EBC
33RD CONGRESS EUROPEAN BREWERY CONVENTION

EFFICIENT BEER RECOVERY FROM SURPLUS YEAST

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Heineken

PUNTIGAMER
DAS „bierige" BIER

INTRODUCTION

- Improved Surplus Beer Mangement
- Reduction of extract loss achieved 4,5%
- Large part of the losses are related to beer content of surplus yeast slurry

INTRODUCTION

- Output approx. 1,1 mil. hl p.a.
- Yeast slurry accumulated: 20.000 hl
- Gravity: 10% (+/- 1%)
- Dry matter: 12% (+/- 1%)
- Application: animal feed
- Farmers now prefer solid feed
- Less commercial benefit

PROCESS

- Beer and yeast separated on a weekly basis
- Yeast sediment and sludge collected from Monday to Friday
- Dilution to 10% gravity with water
- Pumping of yeast slurry every 2 hours at a rate 200 hl/h for 5 – 10 min.
- Cooling to grant 4°C
- Pump switched off on Friday midday
- Monday morning – actual separation phase beer from yeast slurry
- Beer yielded is flash pasteurised at 80 p units and distributed into fermentation tanks

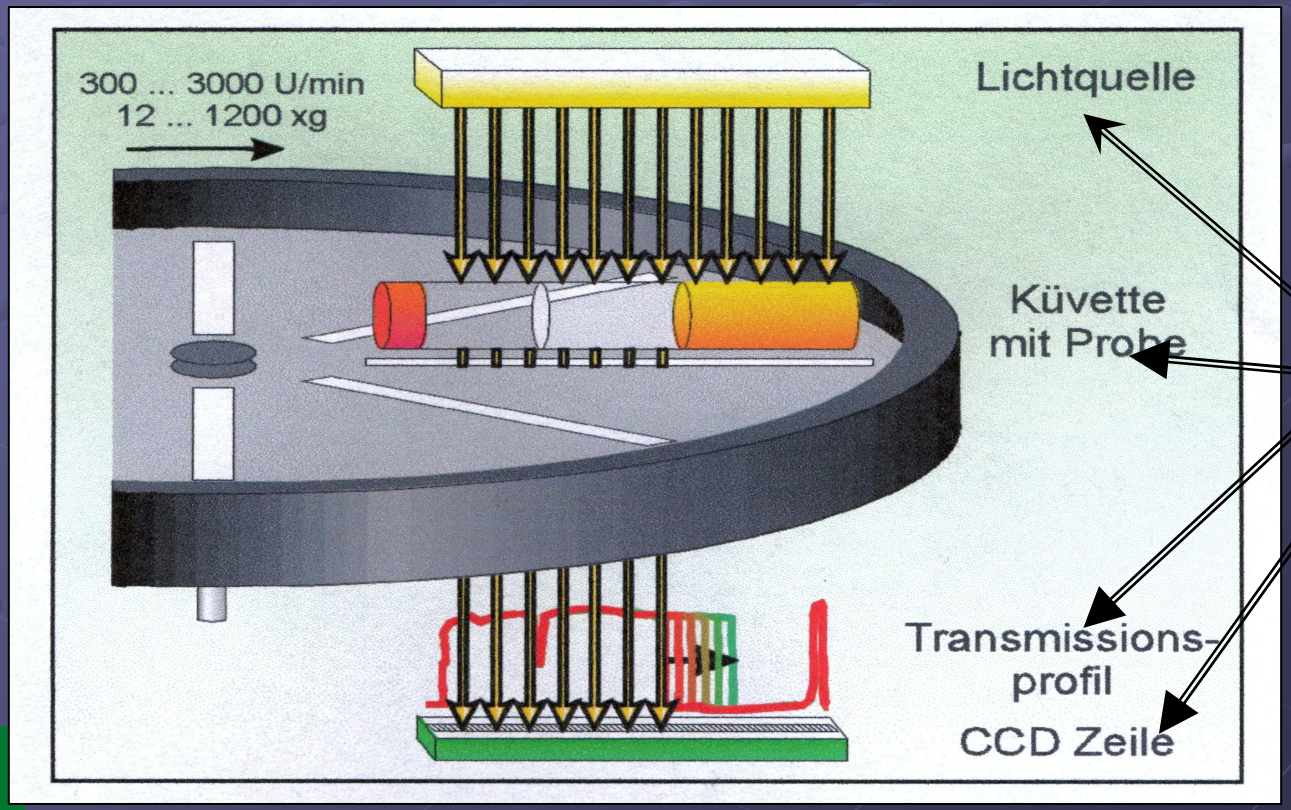
CHALLENGE

- Add a food grade flocculant to raise the dry matter of the yeast slurry
- Choice made according to Austrian food grade codex and Heineken approval standards
- Separation of beer takes place at 4°C
- The beer is sensorically without fault
- Dead yeast cell analysis show to be below 5%
- No negative influence from fermentation by products
- No negative influence from relevant ageing carbonyls

CHOOSING THE CORRECT FLOCCULANT

- Imhoff cones used for a rough selection
- Sedimentation behaviour tested
- Microscopical examination
- Particle size determination

SEDIMENTATION METHOD



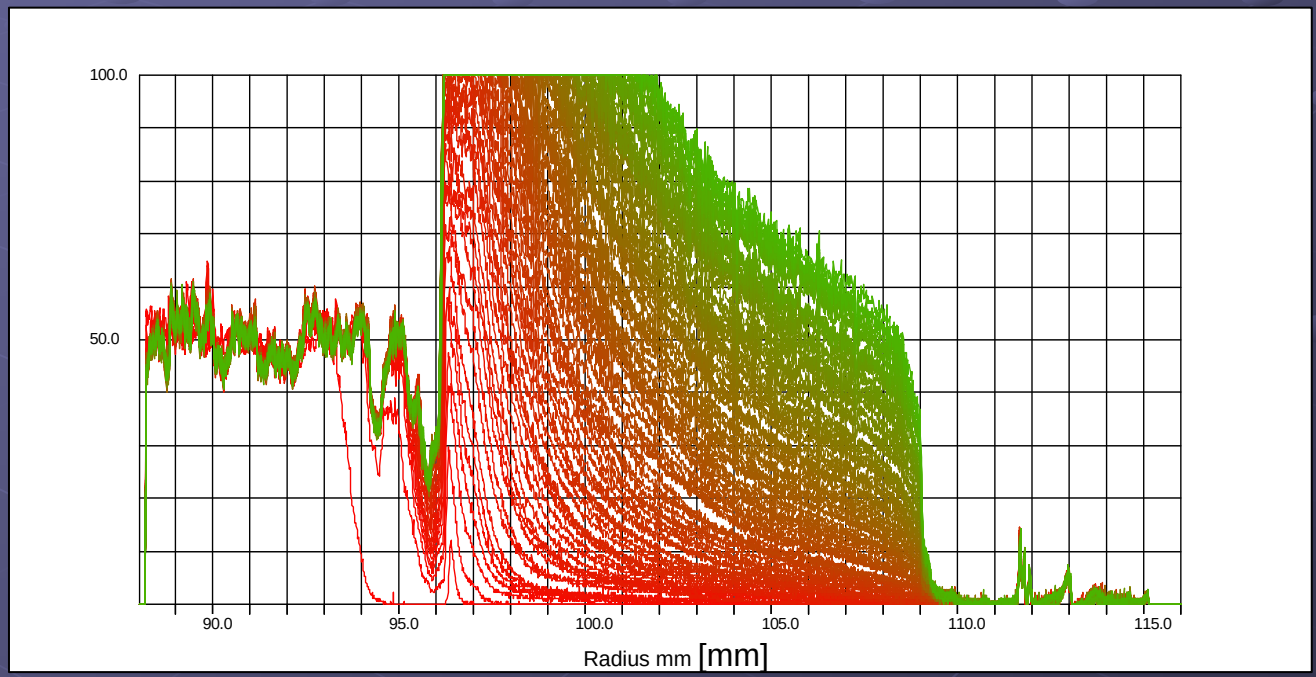
Light Source

Cuvette with sample

Transmission profile

CCD Line

SEDIMENTATION METHOD



The de-mixing graph shows the phase border between sediment and the clarifying phase as a function of time. The rise of the de-mixing curve shows the speed of sedimentation in [µm/s].

SURFACE AREA CHARGE

Measurment of zeta potential

Streaming current detector

MICROSCOPIC OBSERVATION OF YEAST CELLS

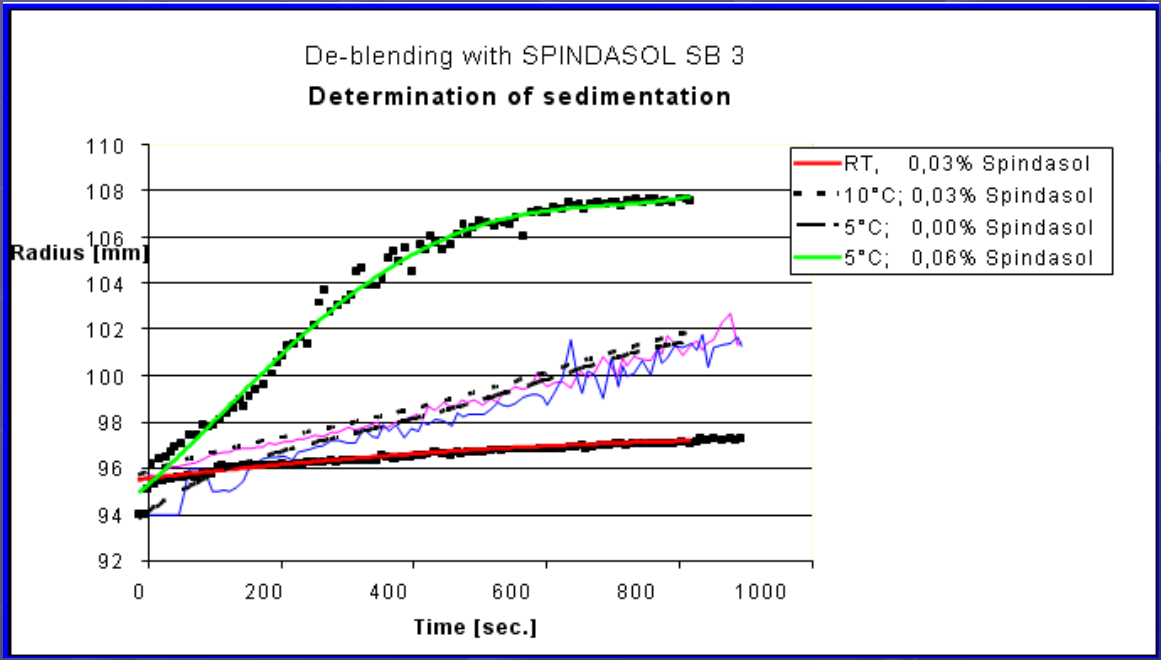
RESULTS

	Spindasol SB3 conc. [%]	Temp = 5° C Q [C/g]	Temp = 10° C Q [C/g]	Temp = 25° C Q [C/g]
Yeast sample	0,00	-2,37	-2,26	-1,30
	0,03	-1,78	-2,65	-1,44
	0,06	-2,29	-2,57	-1,88

DETERMINATION OF ZETA POTENTIAL

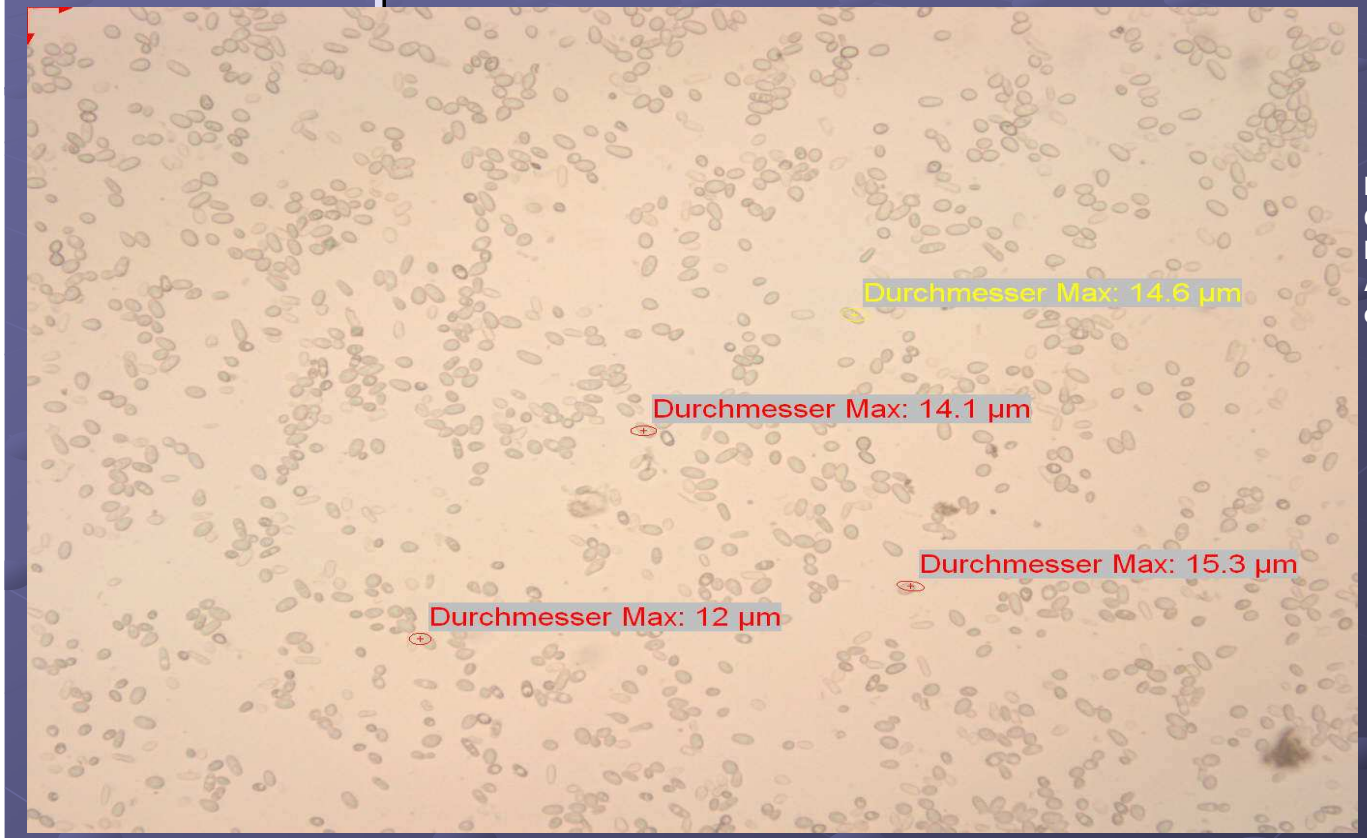
Samples	Zetapotential [mV]
sample 1 non treated	-18,9 +/- 0,32
+0,03 % SPINDASOL SB 3	-20,7 +/- 0,39
sample 2 non treated	-17,2 +/- 0,96
+0,03 % SPINDASOL SB 3	-15,9 +/- 0,67
sample 3 non treated	-16,4 +/- 0,52
+0,03 % SPINDASOL SB 3	-18,9 +/- 0,56

SEDIMENTATION



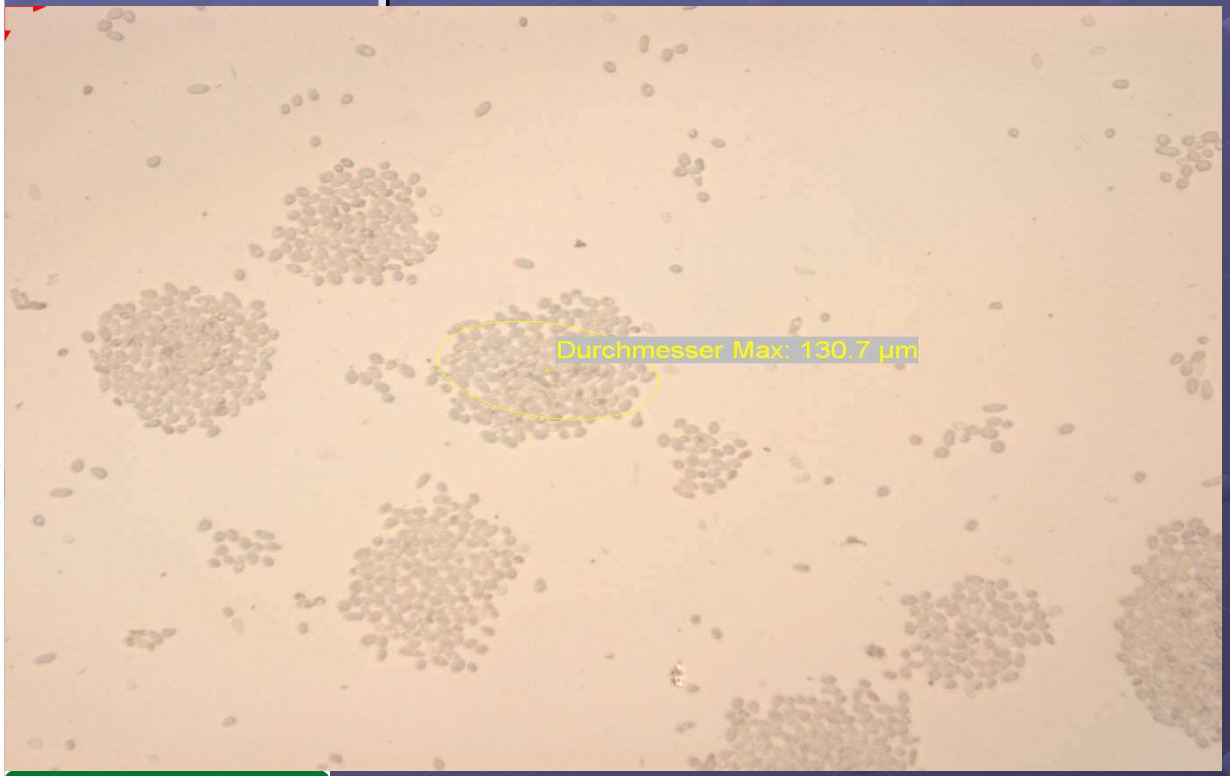
Time elapsed for de-blending of the beer sample with various concentrations of SPINDASOL SB 3 at incubation temperatures of 5 ℃, 10 ℃ and 25 ℃

Microscopic view and determination of yeast cells



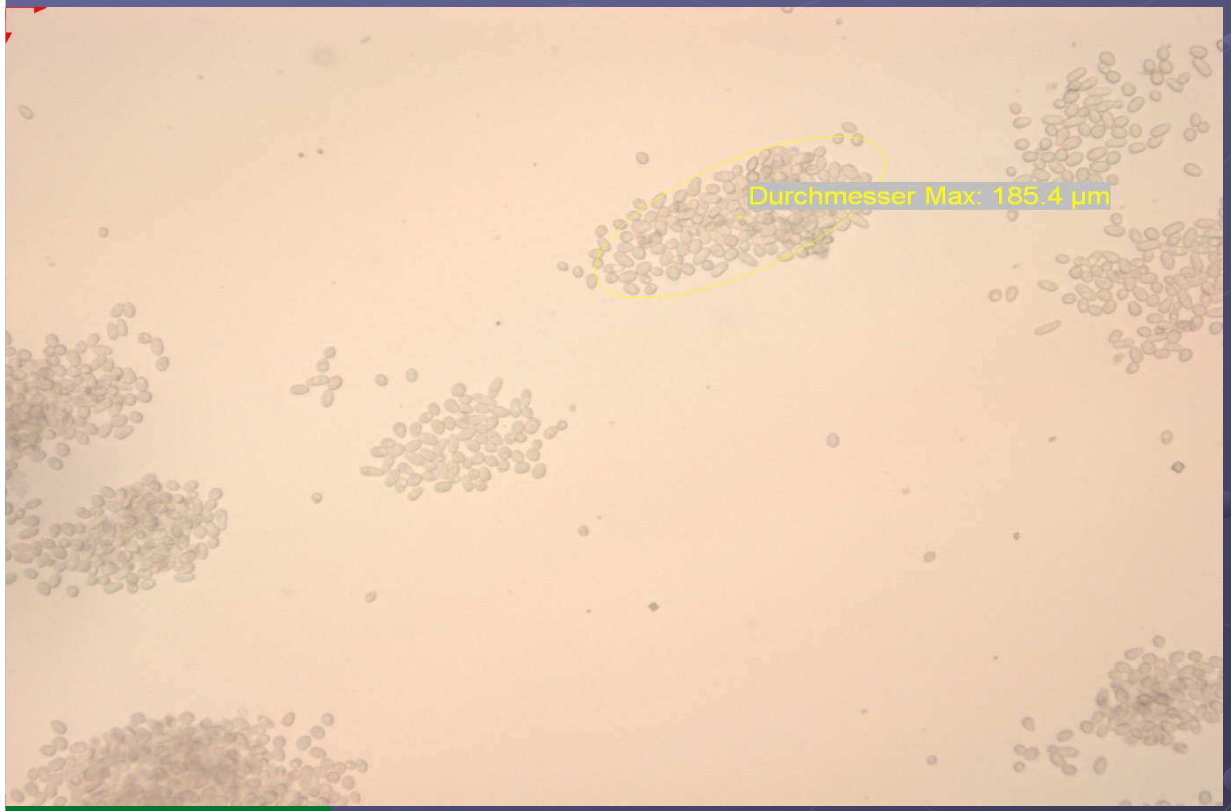
Microscopic view of the yeast cells
Concentration of SPINDASOL SB 3: 0,0%
Incubation temperature: 10 °C
Agglomeration of yeast cells:
occasional, single yeast cell approx. 15 µm

Microscopic view and determination of yeast cells



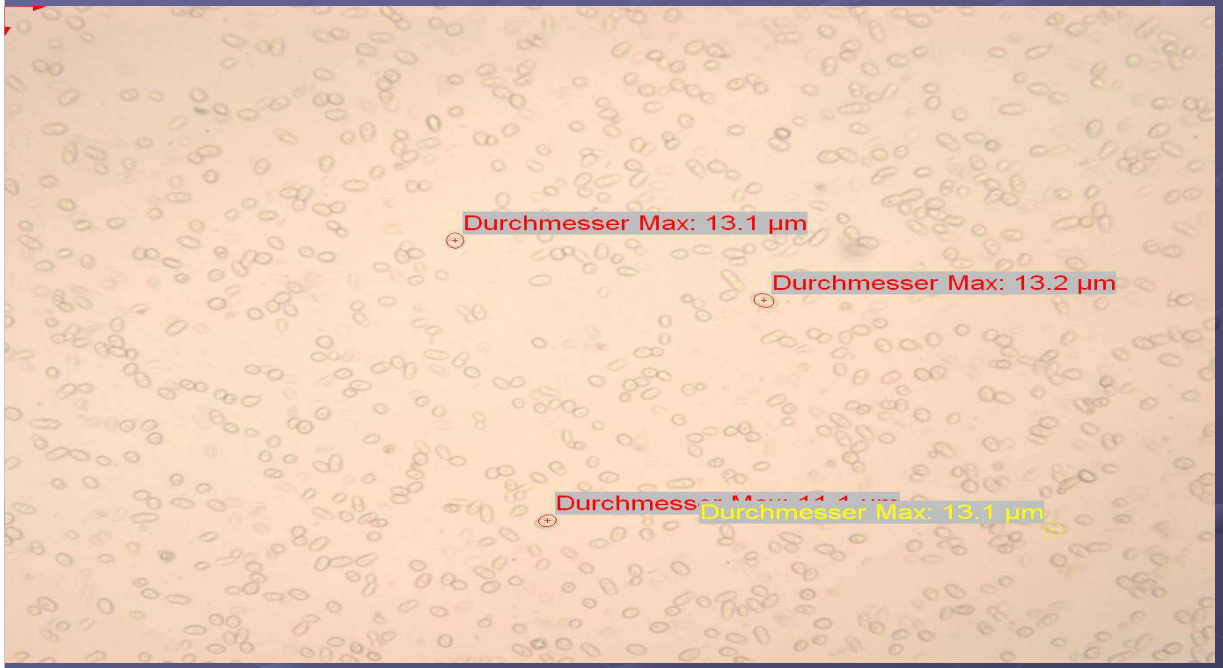
Microscopic view of the yeast cells after trial with SPINDASOL SB 3
Concentration of SPINDASOL SB 3: 0,03%
Incubation temperature: 10 ℃

Micrscopic view and determination of yeast cells



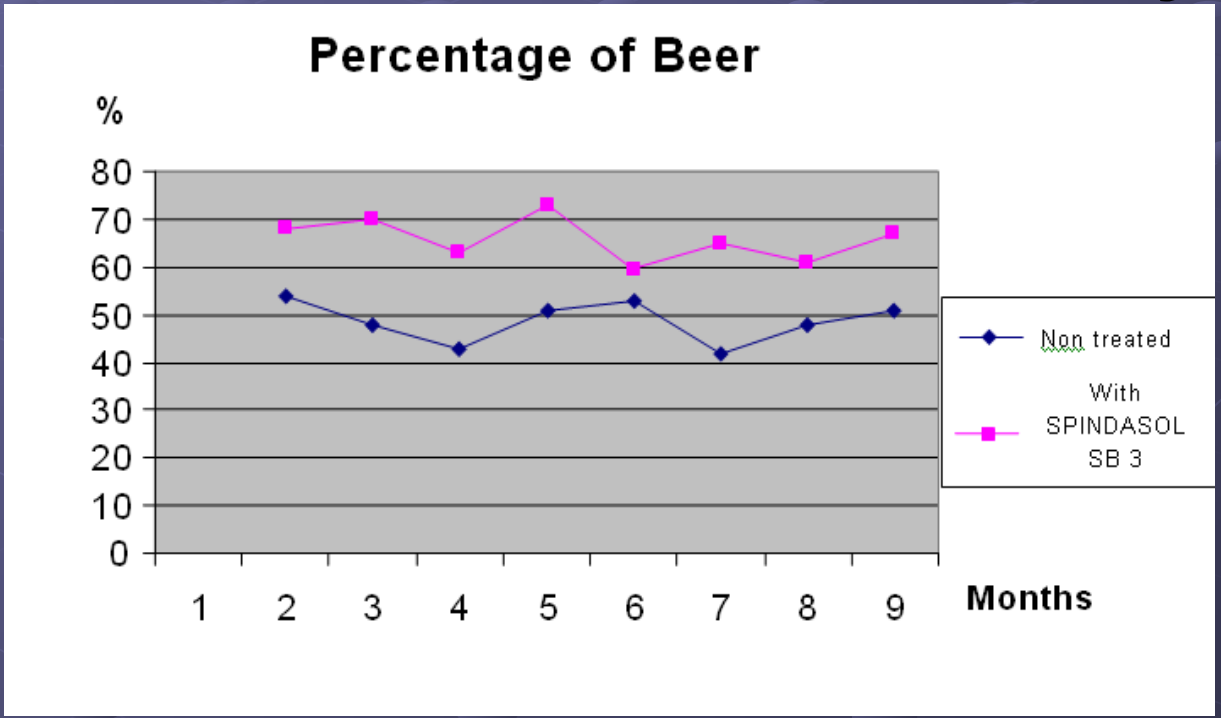
Microscopic view of the yeast cells after trial with SPINDASOL SB 3
Concentration of SPINDASOL SB 3: 0,03%
Incubation temperature: 5 ℃

Microscopic view and determination of yeast cells



Microscopic view of the yeast cells after trial with
SPINDASOL SB 3
Concentration of SPINDASOL SB 3: 0,03%
Incubation temperature: 25 °C
Agglomeration of yeast cells:
none, yeast cells approx. 13 µm

Results from the Brewery



Standard procedure: from 40.000 hl beer yeast slurry → 20.000 hl Beer = 50:50
New procedure with SPINDASOL SB 3 → 25.000 hl Beer = 63:37

Discussion of Results

- Influence of process aids with respect to flocculation sedimentation properties was shown
- Van der Wals forces can be assumed responsible for the aggregation of yeast with the flocculant
- No relevant charge on flocculation system
- Problem solving developed on an industrial scale
- Temperature is a limiting factor
- Van der Wals adsorption form adsorptive energy
- Aggregation potential increases with falling ambient temperature and an appropriate sedimentation aid.

Economy

- Extract yields of 0,4% to 0,7% are possible
- For a Brewery of with 1 mil. Hl output this results in 4.000 – 7.000 hl racked beer
- Assumption: production cost of beer at EUR 6.-/hl
- Annual saving EUR 24.000 – 42.000.-
- No substantial investment into hardware
- Yeast slurry concentration moved by 5 – 7% to a maximum of 19%
- Lower extract losses obtained
- Practically no influence on running costs

Acknowledgements

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- Co-author Stephen Wilkinson, Senior Area Manager, AEB-Group, Italy
- More information on this paper from the Author: g.zanker@brauuion.com

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