

Yeast Propagation & Monitoring





Agenda

- Yeast propagation overview
- Yeast propagation benefits
- Yeast propagation control
- Helpful tips
- Christian Gresser propagation equipment
- Yeast Monitoring with ABER



Yeast Propagation Overview

- 1883 Emil Christian Hansen
- Aerobic respiration to increase biomass
- S. cerevisiae budding reproduction
- Ideal Conditions for growth
 - temperature
 - pH

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- osmotic pressure
- nutrient
- redox potential



Yeast Propagation Benefits

- Higher viability and vitality compared to dry and harvested yeast
- Higher attenuation
- Faster pH-drop

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- Lower amount of fatty acids
- Faster diacetyl reduction
- Consistentcy in fermentation performance
- Cost savings and independence from external yeast suppliers





Yeast Propagation Control

- higher cell growth
- Iower CO₂-content
- more by-products
- temperature-shock during pitching
- Iower solubility of oxygen
- smaller yeast cells

- less by-products
- better solubility of oxygen
- bigger yeast cells
- no temperature shock
- higher CO₂-content
- Iower cell growth

Higher Temperature

Lower Temperature

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Yeast Propagation Control

- higher oxygen concentration
- Iower ethanol production
- Iower CO₂ formation
- lower SO₂ production after pitching
- decreased flavor stability
- higher risk of mutations

- higher SO₂ production after pitching
- better flavor stability
- Iower risk of mutations
- Iower oxygen concentration
- higher ethanol production
- higher CO₂ formation

Higher Aeration

Lower Aeration



Yeast Propagation Control

- higher ethanol concentration
- Iower viability and vitality
- Ionger lag-time after pitching
- Ionger maturation
- inconsistent beer quality

- Iower ethanol concentration
- higher viability and vitality
- short lag-time after pitching
- shorter maturation
- consistent beer quality

Higher Cell Count

Lower Cell Count



Helpful Tips

- Aseptic techniques
- Acclimation
- Lag Phase and the Exponential/ Log Phase
- 10x volume increase
- > 24-36 hours between steps





mbt Brautechnik

- The Prop-Bit is a lab scale yeast propagator with simple, wall or floor mounted panel to control aeration and temperature.
- Dual or Single capable panel
- PropBit Vessels in 25, 50 and 1001
- Mix and Match of sizing is possible
- Prop-Bit Vessels available individually (i.e.: without panel)





- Stand-alone yeast propagation systems (1, 2.5, 5, 7.5, 10, 12.5, 15 & 20 hl)
- Custom yeast propagation systems (1–100hl)







- Consisting of:
 - Yeast tank with internal aeration device
 - Panel with control system for aeration, cooling & heating
 - Hose connections for aeration, cooling & heating
 - Pressure reducer, sterile filter and air meter
 - Swing-bend for safe separation between CIP and production
 - Available in different sizes, in single- and double-execution





- Cylindro-conical yeast tanks, made of Cr-Ni-Mo-steel
- Material 1.4301 (AISI 304)
- > 28 DIN EN 10028-7 AD W2
- max. operating pressure: 14,9 psi
- max. operating vacuum: -200 mWS
- max. operating temperature: 100 °C







- > Only a hygienic aeration ball inside the tank
 - much better hygienic conditions than with agitators
 - perfect homogenization with the offered tank sizes
- No circulation of the medium
 - far simpler propagation systems
 - plug-and-propagate
 - no shearing of the yeast cells
- Christian Gresser held the patent when the system was first introduced into the market (1998)
 - proven technology
 - Decades of yeast propagation and handling experience



- Hard-piping and product panels for the integration into new/existing yeast management systems
- Yeast storage tanks w/ or w/o agitator
- Circulation systems
- Wort sterilization systems
- Integragtion into superior control systems







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The Cell Membrane

- Is impermeable to ions (insulator)
- Which, when in an electric field, polarises the cell
- This allows a capacitive charge to build up
- It is this capacitive charge that is being measured

The capacitance signal is proportional to **Viable** Biomass because only **viable** cells have undamaged membranes





Cells with damaged membranes don't build up capacitive charge



What is being measured?

- » Build up of electrical charge on live cell membranes
- Linear to amount of yeast cells present
- Measured in pico Farads/centimetre (pF/cm)
- Converted to recognized lab units: %VSS or cells/ml

- > Ability of a current to flow through a substance
- Measured in milliSiemens/centimetre (mS/cm)
- Indicates process taking place
 CIP
 - Rinsing
 - Dosing

Capacitance

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Conductivity



Inaccurate Yeast Pitching









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Flow meter







Dosing Pump











Improving pitching rate and fermentation efficiency/time (Meantime Brewing Company, UK)



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Results: A significant improvement in all metrics, namely:

- Pitching rate accuracy
- Efficient use of available yeast
- Decrease in Final Gravity variation
- Fermentation duration and variation
- More efficient and predictable use of FVs resulting in increased brewery output



Summit (USA) achievements

- Optimised yeast management
- Increased vessel throughput
- Reduced labour

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- Improved accuracy and consistency of pitching rates
- Enabled Summit to tie in pitching rate accuracy with yeast viability
- Optimised their entire system
- Complimented their existing technology
- Robust and reliable technology

Meantime (UK) achievements

- Improved consistency
- Improved fermentation performance
- Accurate pitching of live yeast
- Accuracy across different yeast strains, targets concentrations and volumes
- Reduced batch to batch variation
- Easy to use

Damian McConn's/Summit's testimonial can be found using the following link: <u>https://www.youtube.com/watch?v=kLvcgWBTVYE&feature=youtu.be</u>



The Aber CountStar Yeast: an automated cell counter using traditional dyes

	Constant of Sour	
	Court - lear	
		-
	Count = star Automated Cell Counter	

ountestar	Aber KT bakers yeast
	Std_Si
Sample ID: diameter test 1	Reactor ID: kathrvn.thomson
Image No: 1	Process time: 27/01/2014 15:20:1
System Name: 010601	Dilution: 1:1
Total yeast conc: 1 49"10^7/ml	Live veast conc: 1.42*10*7/ml
Total yeast num: 1.49*10^8	Mortallty 4.99%
Avg Diameter: 6.52 m	Avg Compactness: 0.83
Aggregate Rate: 24.68%	
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Information provided by the Aber CountStar Yeast

Significantly less variability than manual method, especially for viability





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Key Benefits of the Aber CountStar Yeast

- Cost effective, reliable, and time-saving alternative to manual cell counts
- Uses safe traditional dyes
- Simple preparation routine slides with pre-calibrated sample volume
- Improved accuracy and repeatability
- Data easily comparable with previous haemocytometer records
- Auto-focus image analysis eliminates guesswork
- Software automatically saves cell count data report, including images



Questions?