Tunnel Pasteurization for the Craft Brewer and Beyond

UNITED WE BREW™

Pasteurization

Jared Jones, Codi Manufacturing

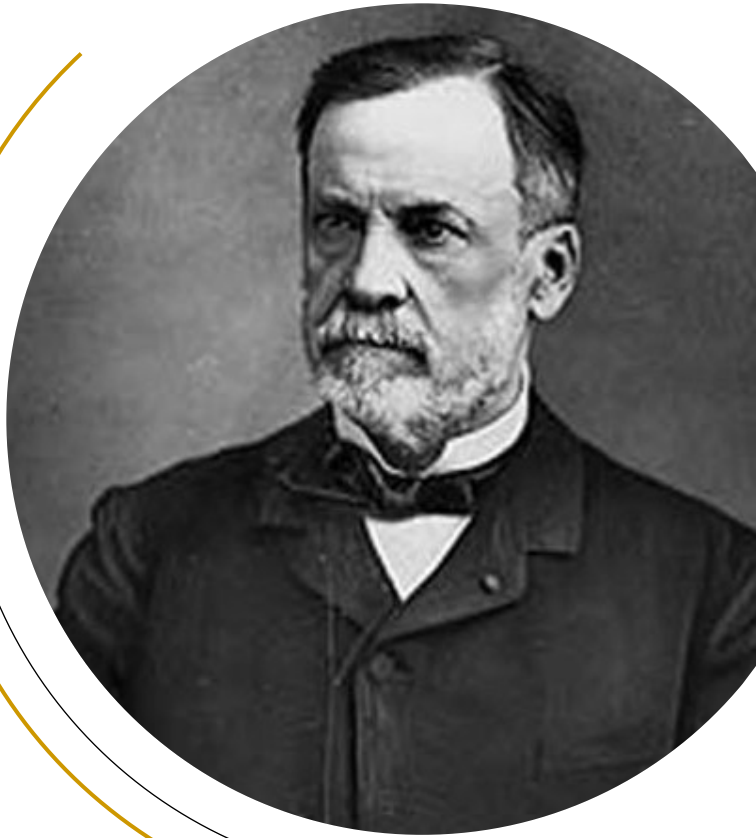
Introduction

- The process of heating and then rapidly cooling liquids or food in order to kill microbes that may expedite their spoilage or cause disease.
- The French scientist who invented the process of pasteurization was **Louis Pasteur**, the source of the name for this important process.
- One Pasteurization Unit (PU) is calculated as such:

$$PU = t \times 1.393^{T-60}$$

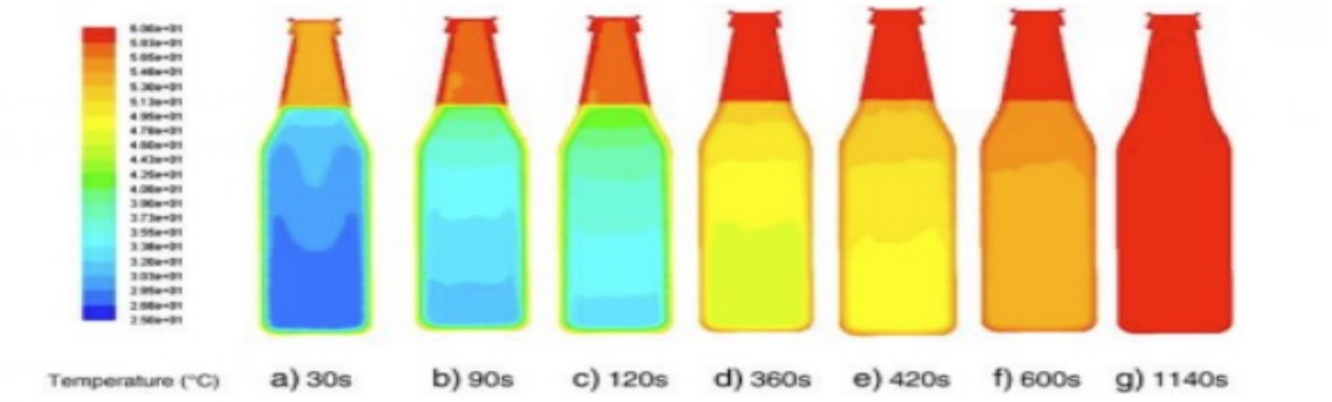
T=degrees in Celsius

t=time in minutes product is held at T



Tunnel Pasteurization

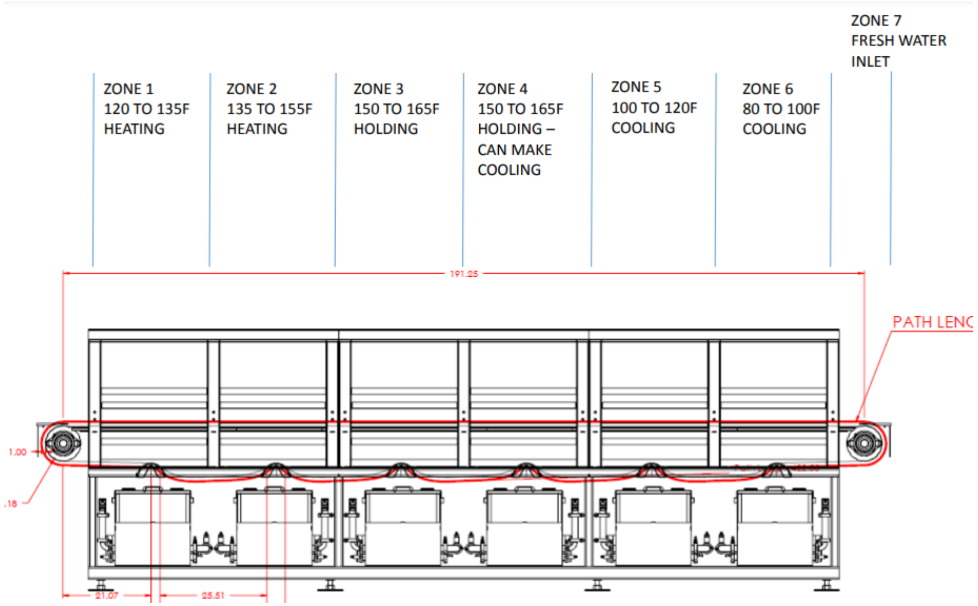
- A tunnel pasteurizer offers a way to consistently pasteurize packaged beverages.
- Sprays hot water over the cans to elevate them to a specific temperature.
- Temperature is maintained for a predetermined amount of time to achieve beverage-specific pasteurization units (PUs) that kill microbes within the beverage
- Cans are then cooled and sprayed with clean, fresh water before exiting the tunnel



Pasteurizer Design

Why are Multiple Zones Important

- Efficiency of Machine – Re-using water from Zone 1 to Zone 6 and vice versa reduces energy load on the system
- Consistency of Pasteurization Units on a Container –
  – If you just spray with One Temperature or a couple different temperatures your pack will have a variance of PUs.



Significance and Sensory

Wesley Deal, Barrel Brothers Brewing

Facing the Craft Brewer of Today:

- SKU explosion/Proliferation
- Growing demand for
  - FMB RTD/RTE products
  - Non-alcoholic beverages
  - Spirits and Spirit-based cocktails
  - Functional Bev-Alc and Non-Alc products
- Premiumization
- CAPEX required to adapt to new trends

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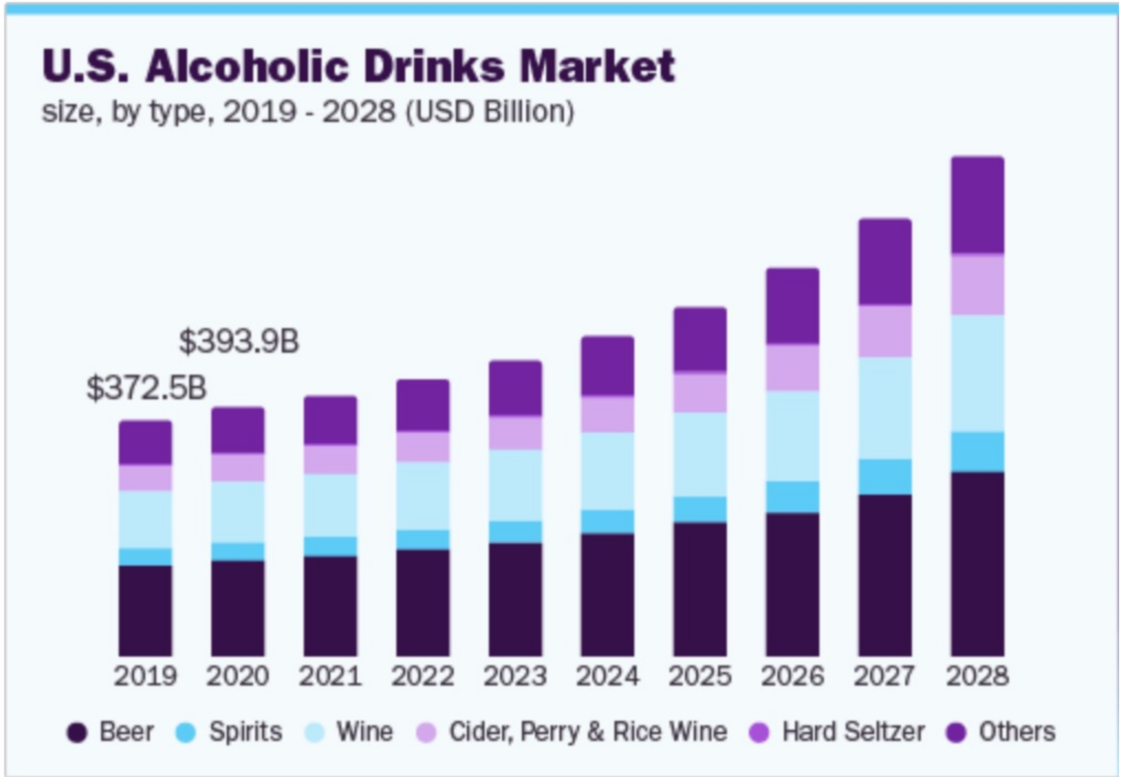
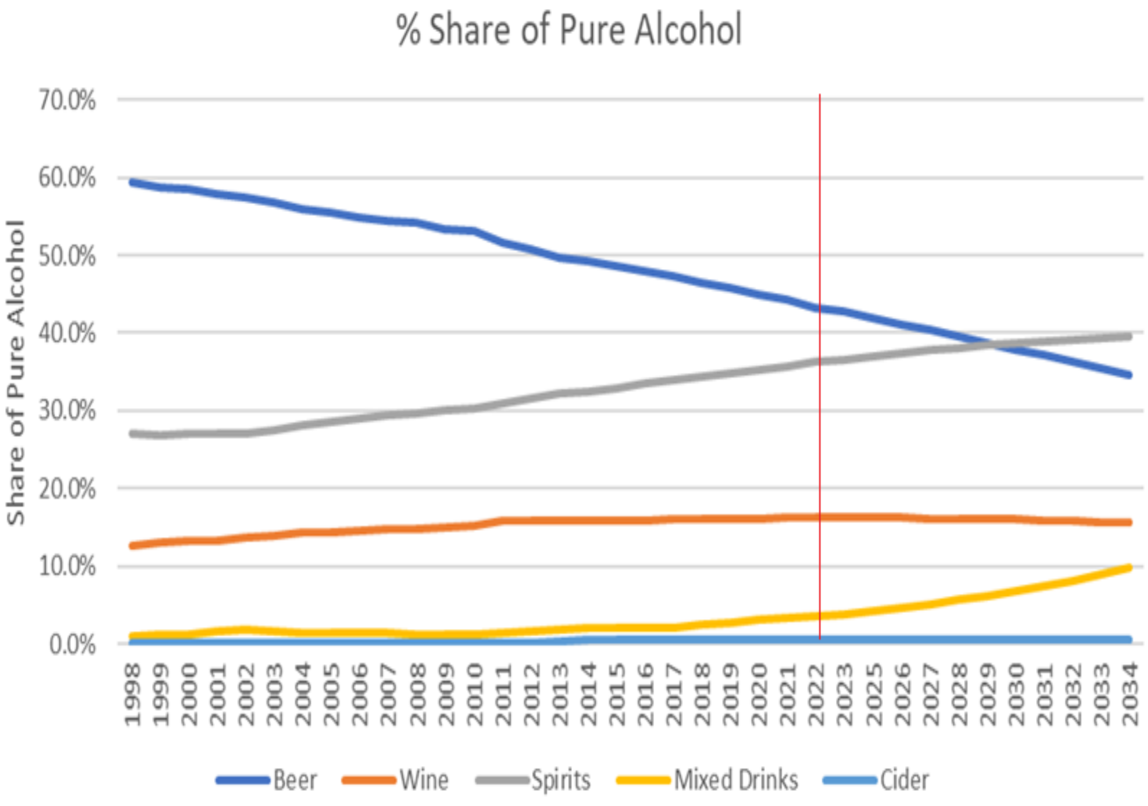
Changing Consumer Trends:



Source: Grand View Research



Source: IWSR.com

Barrel Brothers’ Response

GoLo

- Installation of continuous flow vacuum distillation equipment
  - NA Beer, Wine, Spirits, Cider, etc.
  - Conventional spirits with distillers license
  - RTD Spirit Based Cocktails
- Early learnings
  - Needs for pasteurization for NA products
  - Significant industry interest in NA products
  - Production equipment serves broad needs across the industry-significant contract service upsides
  - Way forward: Innovative products require non-standard equipment

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Pasteurization Study: Products Evaluated

Non-Alcoholic

- Mexican Lager hopped with Hallertau Mittelfrueh
- IPA hopped with El Dorado and Galaxy

Craft Beer

- Fruited Sour IPA with Prickly Pear and Watermelon hopped with Calypso, Enigma, and Caliente hops
- Hazy IPA dry-hopped with El Dorado, Calista, and Galaxy hops

Sensory Exploration

SKU	Discrimination Test	Sample Size (n)	p-value 30 PUs	p-value 45 PUs	p-value 60 PUs
Non Alcoholic Mexican Lager	Triangle	26	0.350	0.220	0.580
Non Alcoholic Citrus Hazy IPA	Triangle	26	0.120	0.120	**0.020**
7% ABV OnlyCans Hazy IPA	Triangle	26	**0.009**	**0.002**	**0.00**
6.8% No One Man Should Have All That Sour Fruited Sour IPA	Triangle	26	0.518	0.220	0.120
*Cicerone Evaluated				Statistical significance p<0.05	

Scientific Investigation

Emily Wang, Fermly

Chemical Analysis

What aspects of the beverage are changed by heating?

- ABV
- pH
- IBU
- Nutrition

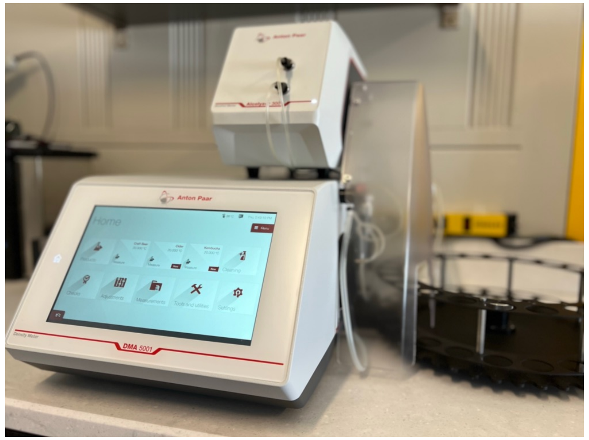
Microbiological Analysis

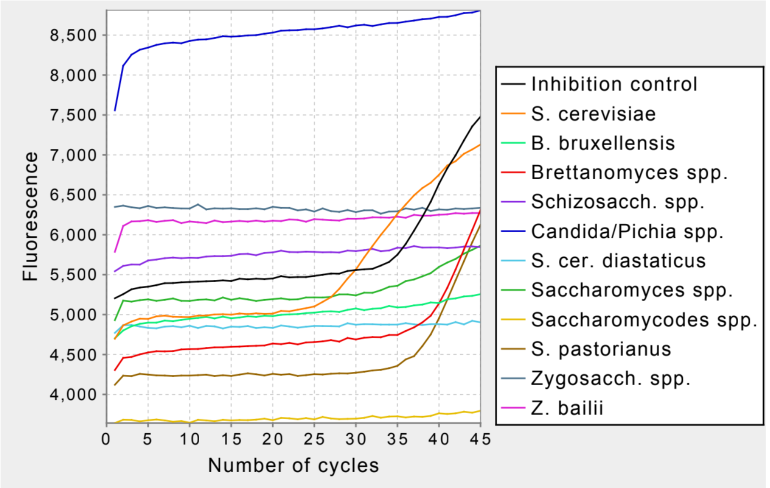
Are microbes that impact product quality affected?

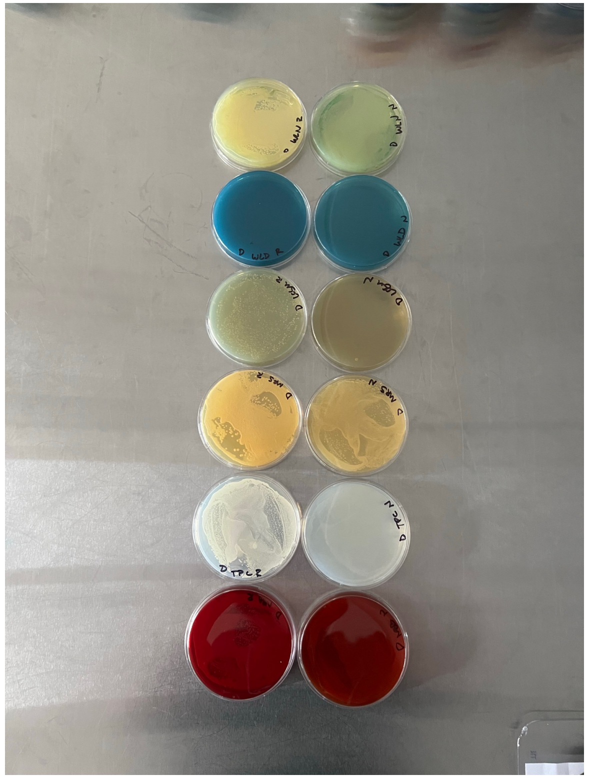
- Yeast
- Spoilage bacteria
- Food safety bacteria
- Spore formers

Experimental Design

- Anton Paar DMA 5001 & Alcolyzer
  - ABV, SRM, ADF, RDF, extract, Calories
- UV/Vis Spectrophotometry
  - IBU, protein, carbohydrate
- pH meter
  - pH
- Plating
  - Assess growth of microbiological contaminants
- Pall GeneDisc
  - Identify and assess viability of common microbiological contaminants, spoilers, and pathogens



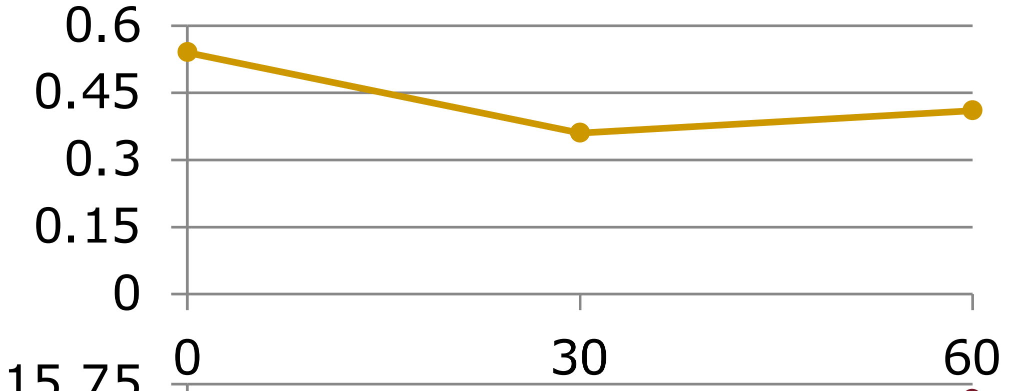




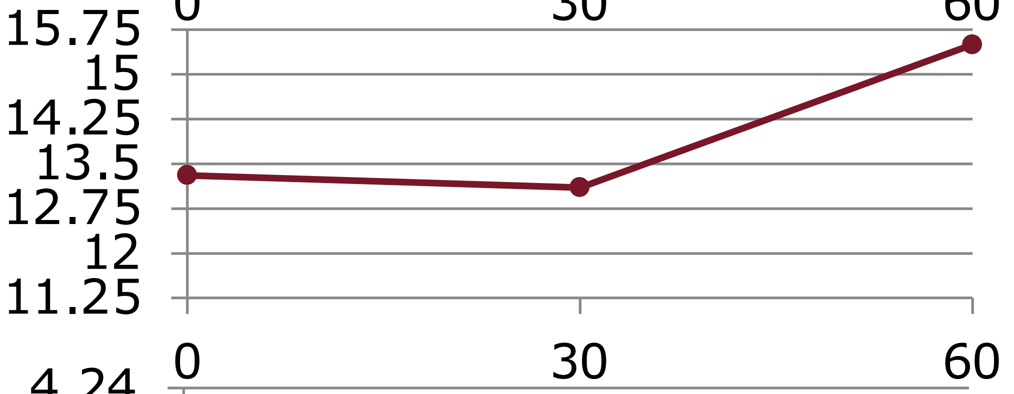
Mexican Lager (Non-Alcoholic)

- Hopped with:
  - Hallertau Mittelfruh
- qPCR
  - *Saccharomyces*: viable to 15 PUs
- Plating
  - Spore formers and motile rods through 30 PUs, but not *Saccharomyces*

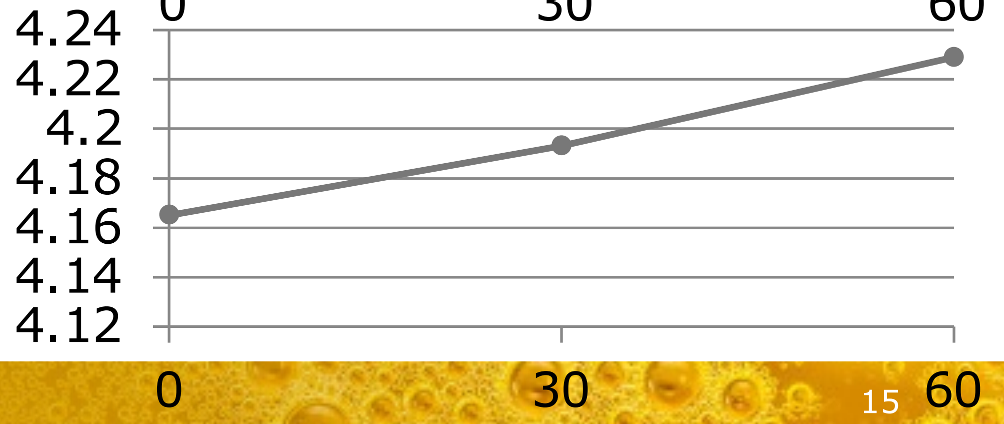
- ABV



- IBU



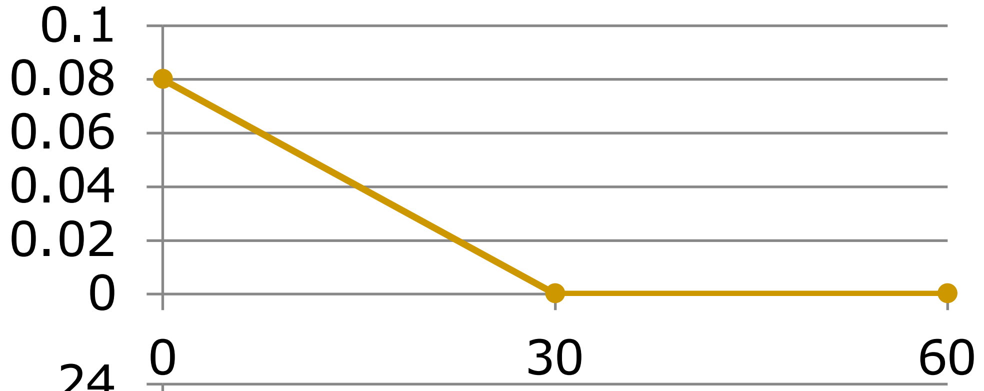
- pH



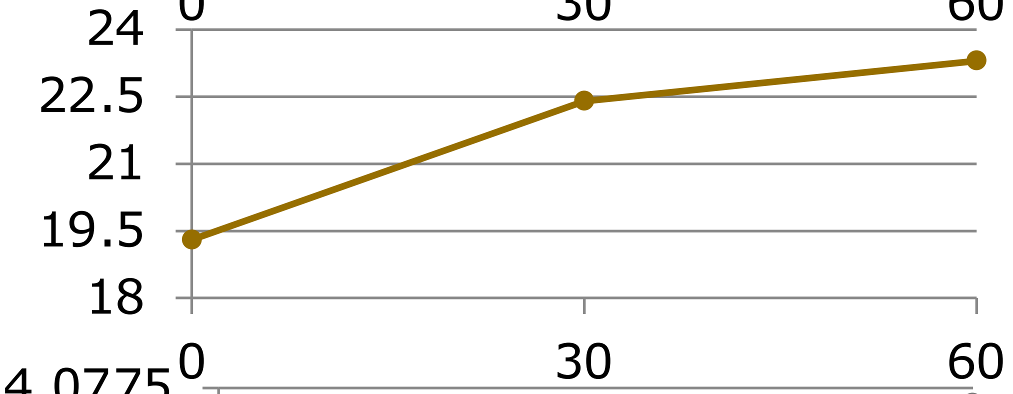
Hazy IPA (Non-Alcoholic)

- Hopped with:
  - El Dorado
  - Galaxy
- qPCR
  - *Saccharomyces*: viable to 60 PUs
  - *Saccharomyces* species: viable to 60 PUs
- Plating
  - Spore formers and motile rods through 30 PUs, but not *Saccharomyces*

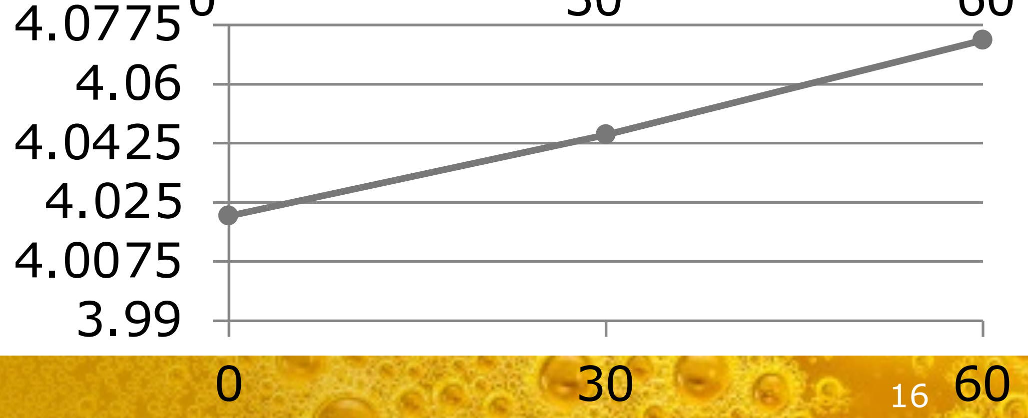
- ABV



- IBU



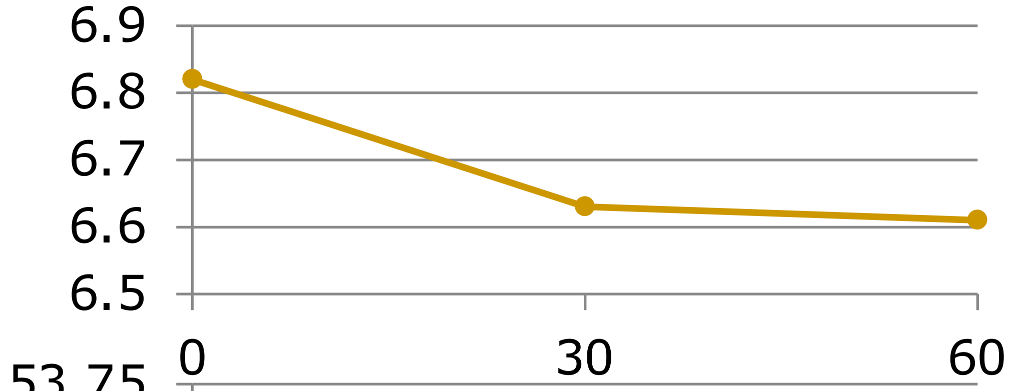
- pH



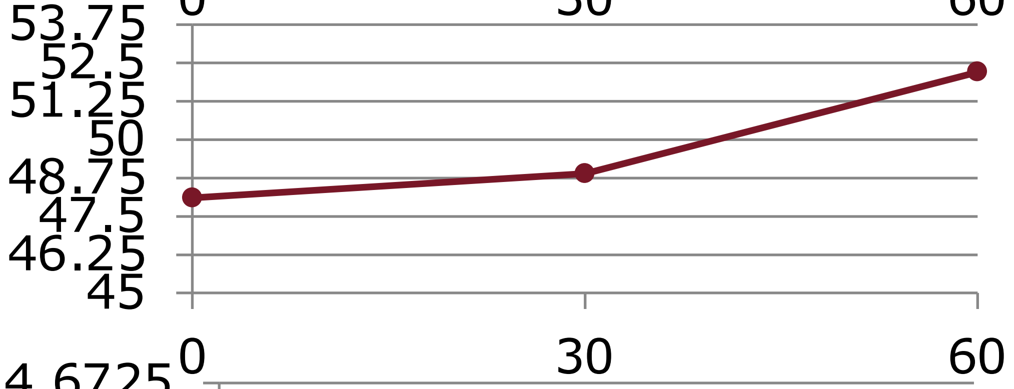
Hazy IPA (Alcoholic)

- Hopped with:
  - El Dorado
  - Callista
  - Galaxy
- qPCR
  - *Saccharomyces*: viable to 60 PUs
  - *Saccharomyces* species: viable to 60 PUs
- Plating
  - Spore formers and motile rods through 30 PUs, but not *Saccharomyces*

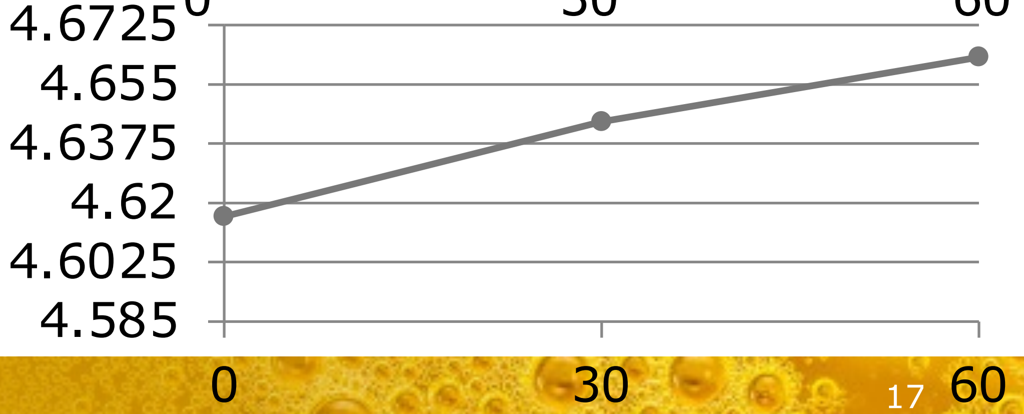
- ABV



- IBU



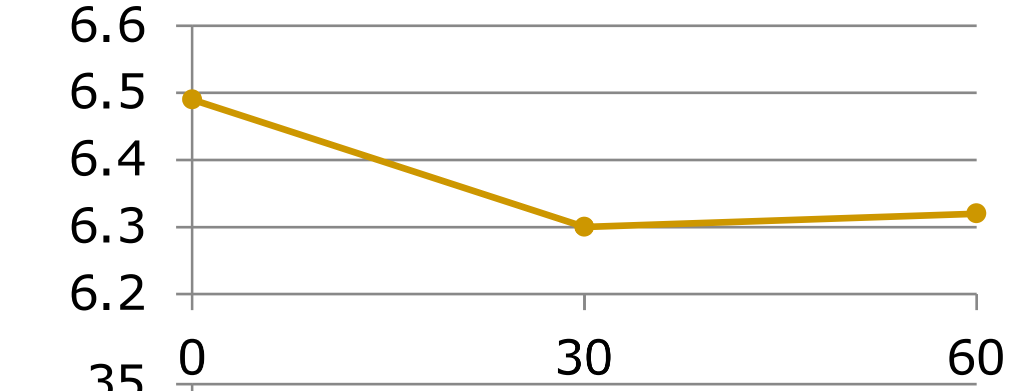
- pH



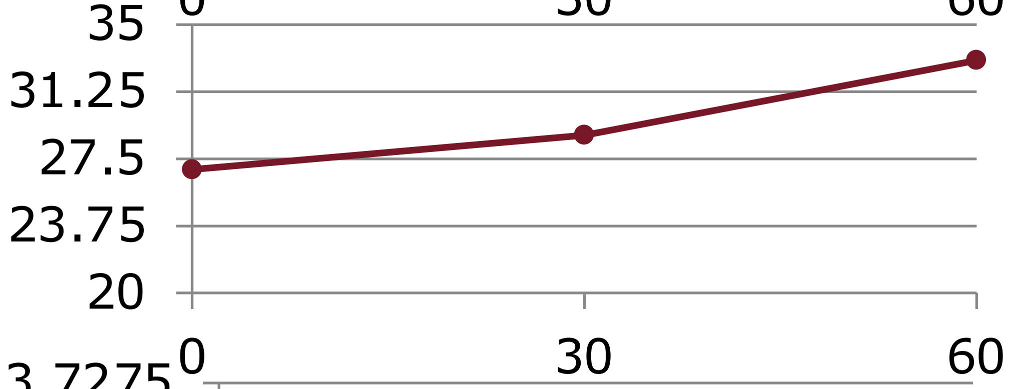
Fruited Sour IPA

- Hopped with:
  - Calypso
  - Enigma
  - Caliente
- Fruit added:
  - Prickly pear
  - Watermelon
- qPCR
  - *Saccharomyces*: viable to 60 PUs
  - *Saccharomyces* species: viable to 60 PUs
  - *Lactobacillus (para)collinoides*: not viable
- Plating
  - Spore formers and motile rods through 30 PUs, but not *Saccharomyces*

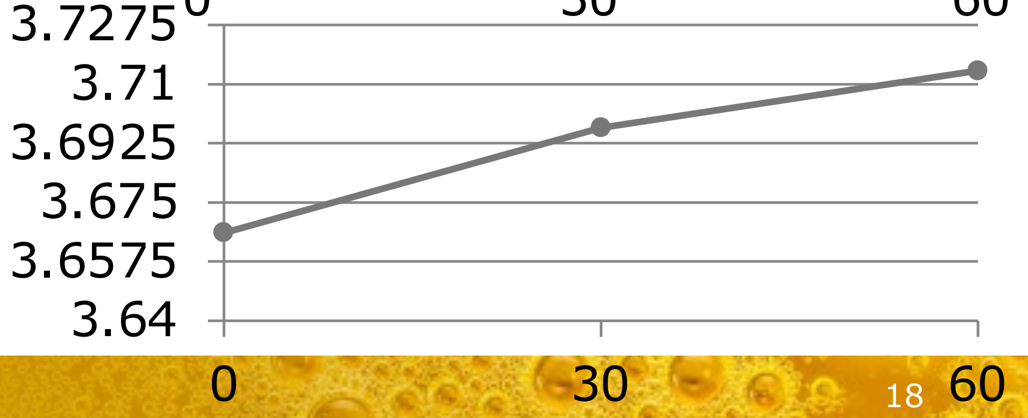
- ABV



- IBU



- pH



Discussion

- Increase in IBUs most likely due to achieving isomerization temperature
- ABV decrease and pH increase connected
- Increase in PUs=new growth?
- Shelf-stability
- No correlation indicated between DNA viability and culturability
- Old methodology meeting new knowledge

More to research!

Cleaning Practices

Dana Johnson, Birko-A Diversey Company

Sanitation Matters

Pasteurization Does Not Lessen The Need To Clean!

- Brewhouse cleaning is very important!
  - (Caustic, Acid, Sanitizer)
- Fermentation Vessels (FV)
  - Must be cleaned and sanitized each and every time
- Brite Beer Tanks (BBT) - Low dissolved oxygen (DO)!
  - (AUP- Acid Under Pressure) can conserve CO2, time, and keep Dissolved Oxygen in check
- Fillers Must be kept clean and sanitized
  - Keep the spore forming organisms in check!
- Routine Passivation is important to keep the metal in good shape and flavor neutral

Keep Clean and Brew On!

Resources

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Q&A