

Brewing Summit 2014

# Maintaining Quality during the growth of your brewery

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## Outline:

- Consistency
- Tracking consistency- SPC charts
- Calibration
- Brewing Chemistry/instrumentation
- Sensory
- Flavor matching between breweries
- Safety
- Support services

## **Consistency is the secret to success!**

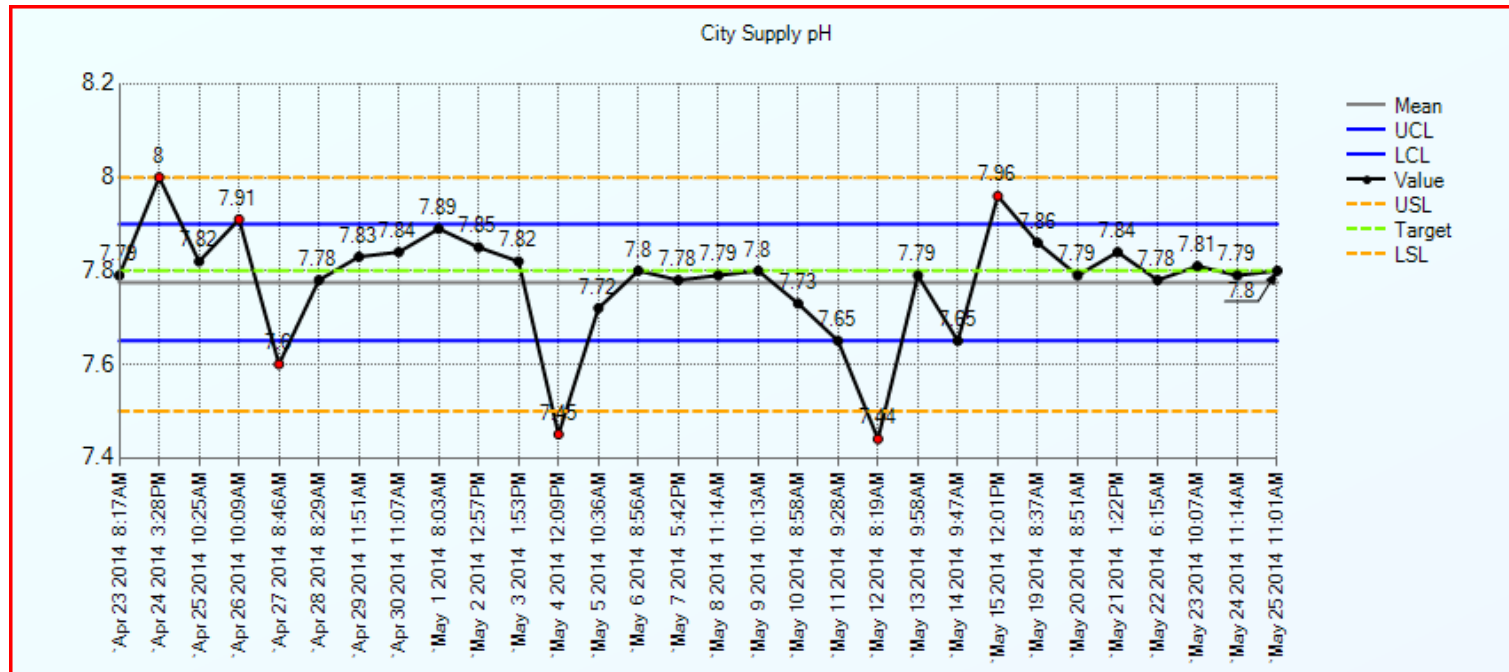
- Beer drinkers becoming more educated about quality
- You will never get a second chance to make a first impression

## **Statistical Process Control (SPC)**

- Standard method
- Measurements are collected
- Establishing upper and lower control limits

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- SPC itself will not make improvements
- SPC is a tool



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- One good definition for a quality beer is simply “a beer that consistently meets specification.”
- Having processes for every aspect of the business, plus a well thought-out system for monitoring them is essential to make sure the quality of your product is maintained.

## Calibration

**The data you generate is meaningless if you do not perform timely and accurate calibrations.**

# Brewing Chemistry

- Water supply
- Specific gravity/density
- Apparent extract
- Alcohol
- Water pH, beer pH, wort pH
- Color/BU/polyphenols
- Haze
- Diacetyl
- Microbiology
- Dissolved oxygen,
- Carbon dioxide
- Headspace air, fill heights



## Water supply

- Water analysis from supplier
- Provides brewer with levels of ions and contaminants that can affect brewing process
- Taste and smell the water

## **Water quality testing**

- Chlorine test kit (\$60)
- Total hardness test kit (\$25)
  - Alkalinity test kit (\$25)
- Boiler feed water, and water used to cool compressors should be routinely tested for hardness

## Instrumental Analysis:

- OG
- Alcohol content
- Rapid Fermentation testing



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## Hand-held digital density meter:



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## Benchtop Density meter:



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## Spectrophotometric Analysis

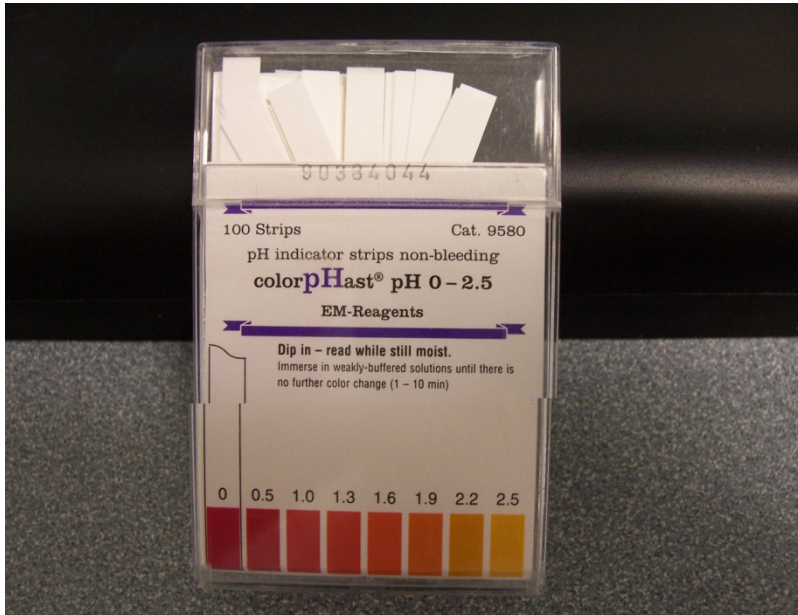
- UV Spectrophotometer  
Cost (\$1,985↑)
- Bitterness units  
Centrifuge (\$2000↑)  
Wrist shaker (\$1500↑)
- Color
- Polyphenols
- FAN analysis



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## pH Analysis

pH paper



pH meter



## Additional Analyses

- Haze analysis (\$12,000 ↑)
- Head Retention
- Diacetyl Analysis
  - Forcing test (no cost)
  - Gas Chromatography (used \$15,000 ↑)
  - Outsource



## Microbiological -Areas of Interest

- Yeast Propagation
  - Yeast brink
- Wort (**sniff samples**)
  - Fermenter
  - Rinse/CIP water
  - Filling machines
  - Kegs & Bottles
- Cans/undercover gasser
  - Growlers

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- Never let anything that touches your beer touch the floor
- Free-standing water or beer
- COP tanks

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## Microbiological Analyses

- Microscope (\$700 ↑)
- Slides (\$3.25 for 100 slides)
- Propane torch, mini burner and stand (~\$50)
  - Glass jars (\$50 for 10)
- Pressure cooker or Autoclave (\$50, \$4,000 ↑)
  - Incubator (\$325-500 ↑)
  - Test tubes, petri dishes

## Media

**HLP**-Anaerobic media checks for the gram positive bacteria lactobacillus and pediococcus

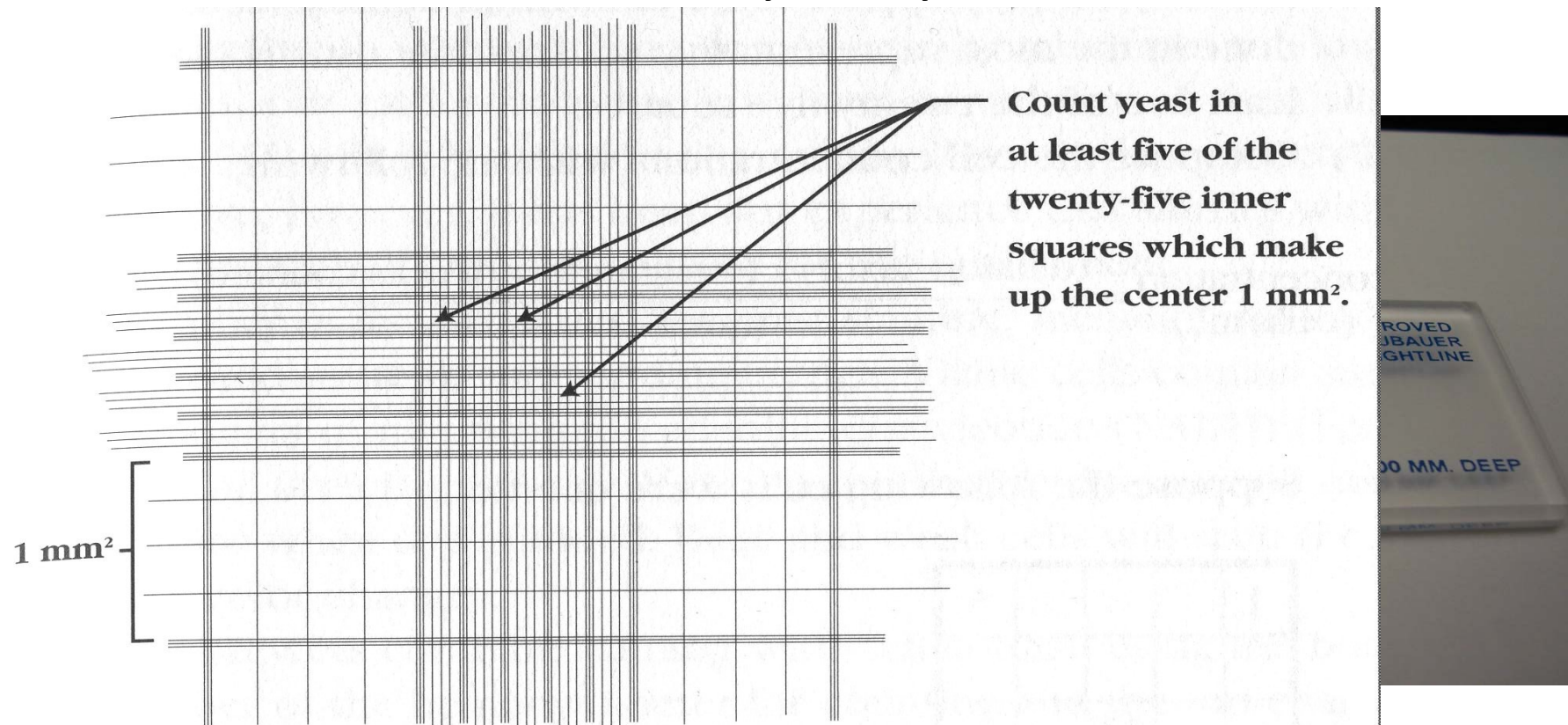
**UBA**-Prepare with and without Actidione (yeast suppressant)

**SDA**-Colonies turn yellow in the presence of acid producing bacteria

**MRS**-For the enrichment, cultivation and isolation of all species of Lactobacillus

## Cell count and Viability analysis

- Hemocytometer (\$50)
- Methylene violet or methylene blue stain for viability analysis



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## Moxi Cell counter

**\$3500**



## Nexcelom Cellometer

**\$15,000**

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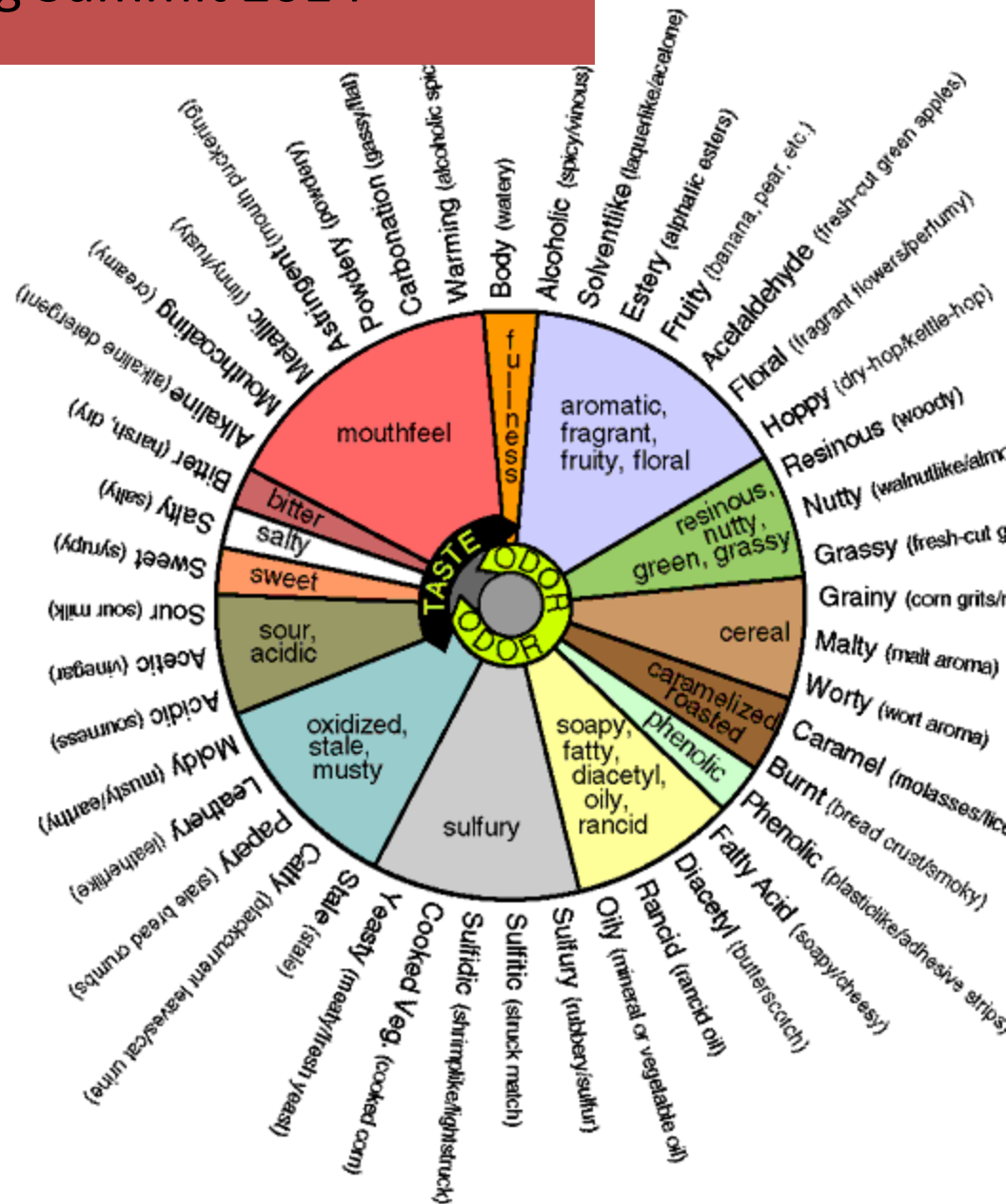
## ATP lightning unit CHARM



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## SENSORY

- Water tasting
- Malt tasting
- Hop teas
- Wort tasting
- Panel training





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- New Equipment Installation
- New Keg Purchase
- Stainless Growler Purchase

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## Flavor Matching with the new NC brewery



- Mineral and Flavor compound analysis (ICP and HPLC)
- Fermenter samples sent from both breweries
- Tasted in a blind format
- Comparison plots of QA analyses
- GCMS

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- Packaging Analysis
- “Zahm & Nagel”
- Headspace Air
- Carbon dioxide
  - uses temperature and pressure chart to calculate CO<sub>2</sub>
- Price New (\$1290)

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## Hach Orbisphere 6110 Total Package Analyzer



## Dissolved O<sub>2</sub> Analysis

- DO meter (**\$~1400**)
- Wort aeration
- Beer in fermenter, BBT, kegs
- Water system



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## Other package tests of value

- Fill heights (gravimetric method)
- Analytical balance required 5000gram (\$100)



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- Request COA from suppliers
- Audit your suppliers
- Maintain lot traceability for recall purposes
- FIFO Inventory control

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**[www.mbaa.com](http://www.mbaa.com)**

- ✓ **HACCP Food Safety Decision Guide**
- ✓ **Tech Tips**
- ✓ **Ask The Brewmaster**
- ✓ **Brewpedia**
- ✓ **Master Brewers' Toolbox 3.0**
- ✓ **Assorted reference books available**

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## Guideline to Growing Your Quality Laboratory

- ✓ **General Equipment, Raw Materials and Packaging**
- ✓ **Chemistry, Microbiology, Sensory**
- ✓ **The Beer flavor wheel, fishbone diagrams, and many reference books and Methods of analysis available**

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Cambridge Scientific  
Products-**Used Lab**  
**Instruments**

Cynmar Corporation  
Scientific Supplies and  
Equipment

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## **Brewing Lab Service Companies**

Siebel Institute - [www.siebelinstitute.com](http://www.siebelinstitute.com)

Brewing and Distilling-Analytical Services  
[www.alcbevtesting.com](http://www.alcbevtesting.com)

Medallion Laboratories-[www.medallionlabs.com](http://www.medallionlabs.com)

**ASBC check sample service – [www.asbc.org](http://www.asbc.org)**

White labs – [www.whitelabs.com](http://www.whitelabs.com)

## **Sites relating to Sensory Analysis:**

[FlavorActiV.com](http://FlavorActiV.com)

[aroxa.com](http://aroxa.com)

## Conclusion

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Thank you to Ken Grossman, Gil Sanchez and the QA and R&D Lab at Sierra Nevada for their assistance.

Thank you for your attention.

