# Automation Options for Small-Scale Systems

Presented By: Kevin Weaver | Brewmation


Brewmation

wmation

# Topics

Introduction

- Art vs. Science
- Automation as it applies to each step in the brewing process
- Level of Controls

*“Anyone can brew a great beer. A good brewer can brew it again.”*

*-Ancient brewing proverb*

Brewmation

BYO NANO CON ONLINE

# The Art of Brewing

- Pursuit of a goal
- Exploration of ingredients, flavors, & styles
- Perfecting & developing recipes
- Creation of something new
- Putting your own stamp on your beer

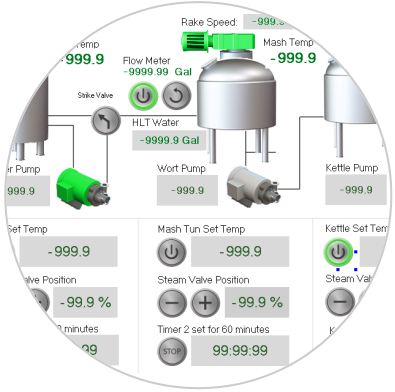
Brewmation

# The Science of Brewing

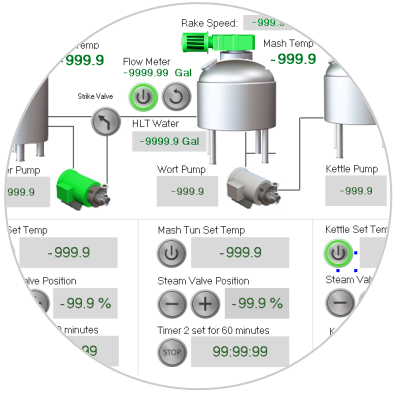
- Control over process
- Ability to rebrew a beer
- Ability to tweak process & parameters to achieve your goal
- Enables exploration, flexibility, & creativity

Brewmation

# Automation facilitates science, science facilitates art




# Automation facilitates science, science facilitates art




So what does automation look like in a brewery?

# Hot Water / Liquor

## Temperature Control

maintaining setpoint is critical to brewing process.

- strike & mash temp consistency
- avoiding overshoot = time saved
- predictable results


Brewmation

BYO NANO CON ONLINE

# Hot Water / Liquor

Heater control

- Electric – Control the element power
- Steam – Control the steam valve
- Direct Fire – Control the burner output


Brewmation

BYO NANO CON ONLINE

# Hot Water / Liquor


Pre-Heat Timer

- HLT will be ready when you are
- allows vessel to equalize with liquor temps

Brewmation

BYO NANO CON ONLINE

# Hot Water / Liquor


Circulation

- even heat distribution throughout HLT
- easier to dissolve water additions
- automated switch over from recirculation to strike-in
- flow meter to transfer the proper volume

Brewmation

BYO NANO CON ONLINE

# Hot Water / Liquor

## Blending (hot & cold water)

when using mixing manifold, temps and flow need to be controlled

- achieves consistent strike temps
- less operator interaction to dial in temps
- ability to auto-switch to cold for knock-out

## CIP

hot water from HLT is typically used for CIP

- Temperatures are critical for many cleaners
- Integrate with automated valves for a fully automated CIP sequences can
- More effective cleaning, less labor


Brewmation

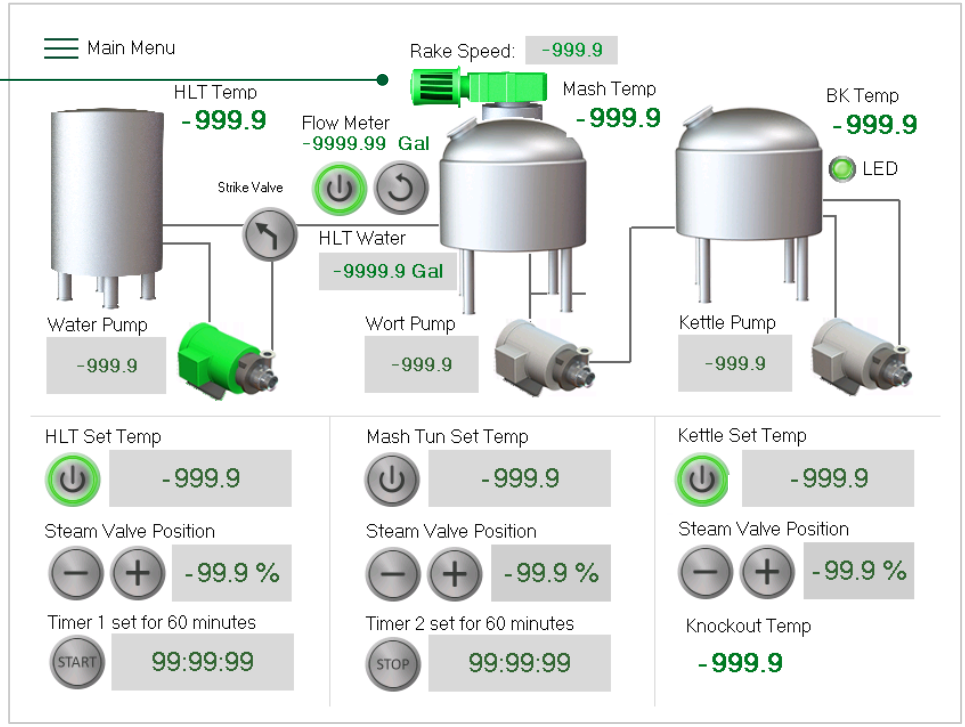
BYO NANO CON ONLINE

# Mashing

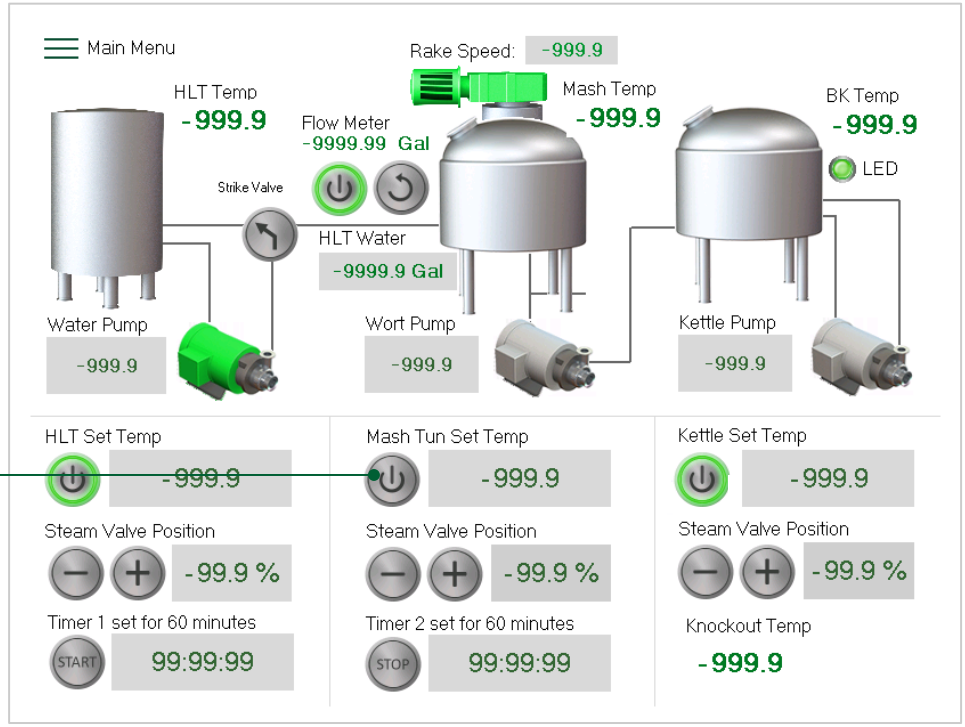
## Mixing & Blending

strike & mash consistency

- grain conveying flow rate
- water flow rate control
- mixer speed control



# Mashing

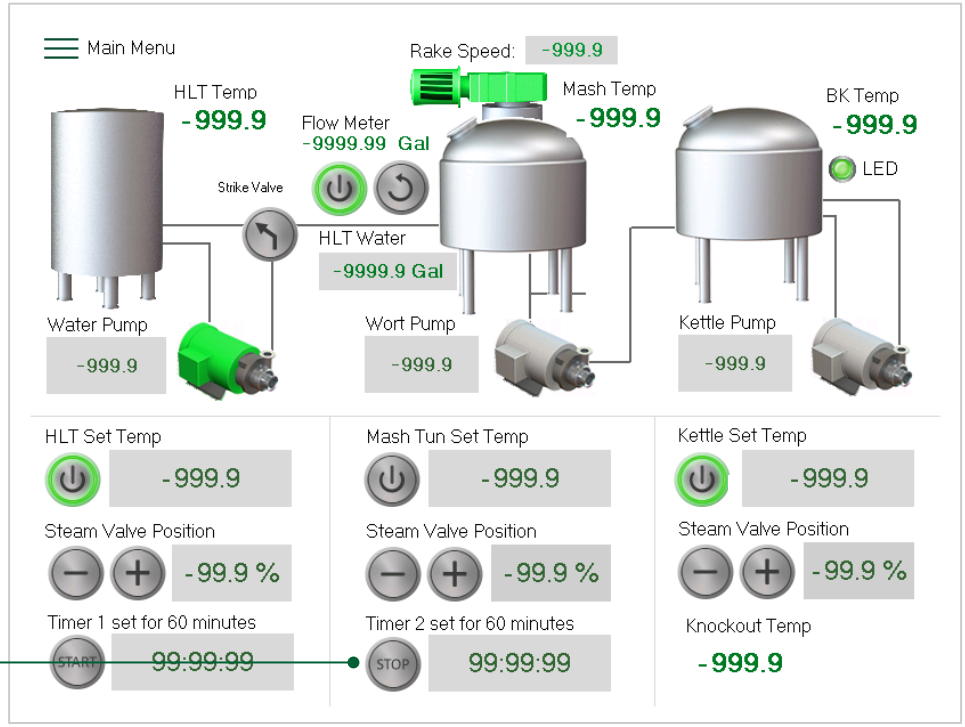



## Temperature Control

maintaining set point is critical for proper conversion

- electric – RIMS / HERMS
- direct fire – direct heat / HERMS
- steam – steam jacket control

# Mashing




## Timing

timing during the mash is vital

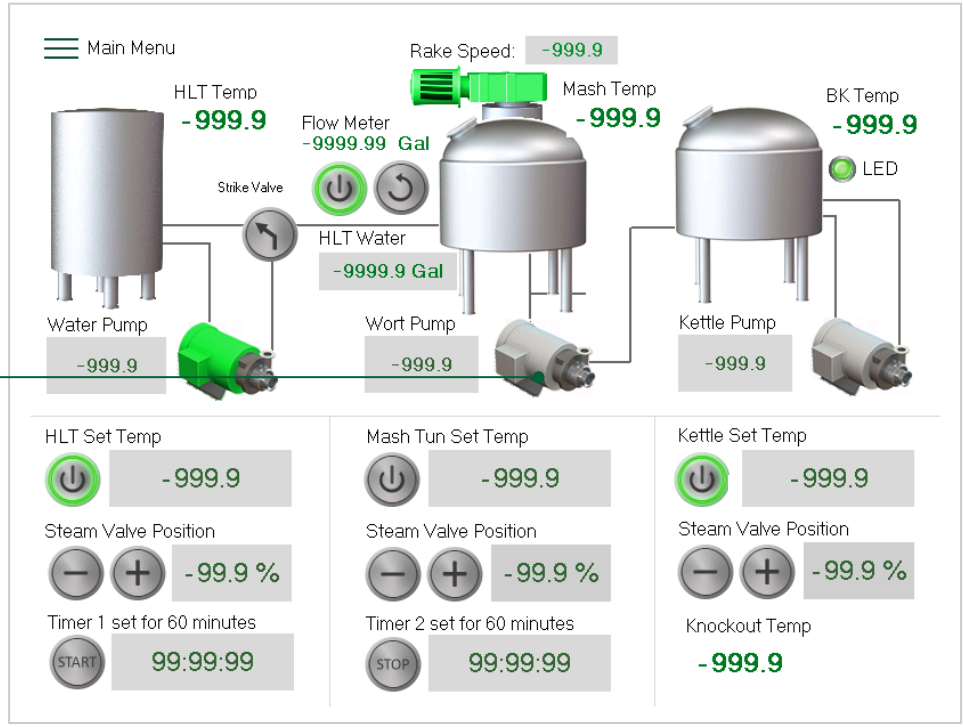
- automated mash temperature steps
- automatically begin lautering or sparging

# Mashing

## Recirculation

circulation speed has many effects on the mash

- controlling speed for even heat distribution
- controlling lautering rate to prevent a stuck mash




Brewmation

BYO NANO CON ONLINE

# Sparging

## Flow Matching
- equalize flow from runoff to sparge
- maintain liquid level

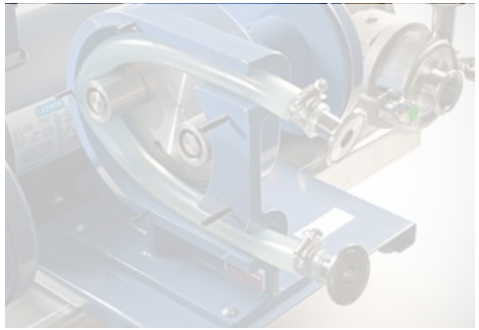
## Temperature
- maintain sparge water & mash out temps

## Speed
- eliminate stuck sparges & channeling

## Sparge Volume
- monitor transfer volume into kettle

## Auto Grant
- keeps liquid level consistent
- enables gravity feed into grant

## pH & Conversion Monitoring
- in-line pH readings
- real-time conversion monitoring



# Sparging

Flow Matching
- equalize flow from runoff to sparge
- maintain liquid level

Temperature
- maintain sparge water & mash out temps

Speed
- eliminate stuck sparges & channeling

Sparge Volume
- monitor transfer volume into kettle

Auto Grant
- keeps liquid level consistent
- enables gravity feed into grant

pH & Conversion Monitoring
- in-line pH readings
- real-time conversion monitoring

# Sparging

Flow Matching
- equalize flow from runoff to sparge
- maintain liquid level

Temperature
- maintain sparge water & mash out temps

Speed
- eliminate stuck sparges & channeling

Sparge Volume
- monitor transfer volume into kettle

Auto Grant
- keeps liquid level consistent
- enables gravity feed into grant

pH & Conversion Monitoring
- in-line pH readings
- real-time conversion monitoring

# Sparging

Flow Matching
- equalize flow from runoff to sparge
- maintain liquid level

Temperature
- maintain sparge water & mash out temps

Speed
- eliminate stuck sparges & channeling

Sparge Volume
- monitor transfer volume into kettle

Auto Grant
- keeps liquid level consistent
- enables gravity feed into grant

pH & Conversion Monitoring
- in-line pH readings
- real-time conversion monitoring

# Boiling & Whirlpooling

## Precise Power Control

- ability to set power level to kettle
- prevents boil-over & scorching
- predictable evaporation rates & hop utilization

## Hop Dosing Time

- remote alerts for boil & whirlpool additions

## Timing

- monitor & stop boil after a set time

## Specific Gravity Monitoring

- real-time readings

## Whirlpool Speed

- precise pump control for optimal speed
  important for cone formation and hop utilization

# Wort Cooling

## Temperature Control

- maintain plate chiller output temp
- reduce time to pitch

## Coolant Flow

- control flow of water or glycol
- maintain flow rate at set temp
- reduce water usage

## Wort Flow Control

- control flow through heat exchanger
- consistent knock-out times
- stead flow through hop back
- measured volume into fermenter

## Oxygenation

- control flow of $O_2$ to stone & reduce $O_2$ usage
- Avoid over/under oxygenation
- repeatable oxygenation

# Cellaring

## Temperature Control

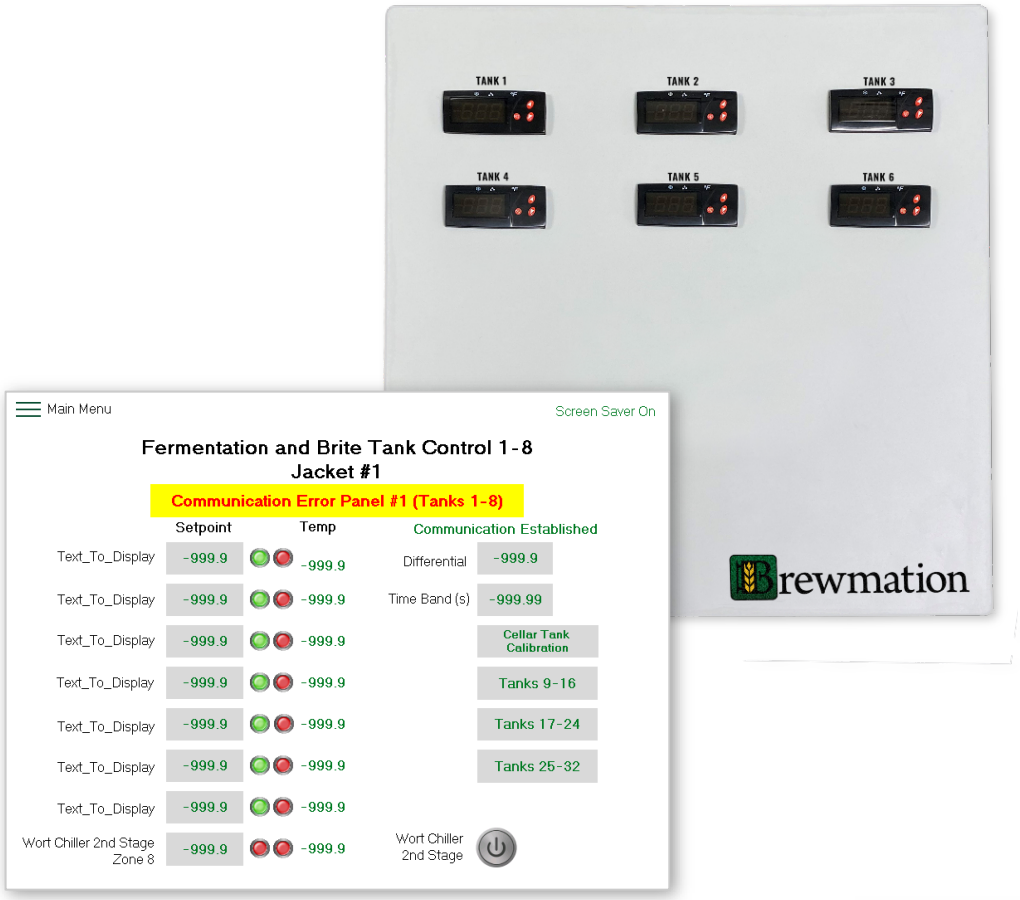
- jacket cooled or heated tanks
- maintain ideal fermentation conditions
- measured fermentation profiles for repeatability

## Timing

- schedule & monitor fermentation temps
- yeast quality control
- lagering schedules
- diacetyl rest & cold crashing

## Hop Dosing

- dry-hop dosing with $CO_2$
- automate hopping schedule



# Cellaring

## Record Keeping

- maintain record of gravity readings & fermentation
- know when to cool crash

## Monitoring Stages

- monitor fermentation progress
- minimize diacetyl & fusel alcohol issues

## Remote Access

- monitor and change fermentation setpoint while away from the brewery


Brewmation

It’s up to you...

# Basic Controls

Basic control systems have a balance of automation and “hands on” control

- Takes care of necessary automation requirements
- Manual controls may still include opening/closing valves, adjusting temperature set points, and measuring volume based on level indicators
- Allows more of a “hands on” brew day
- Budget minded

# Advanced Controls

Advanced PLC / Touch screen based systems offer many features designed for consistency and simplicity

- Endless automation potential
- Data collection
- Recipe libraries
- Remote access
- Expandable
- Allows brewer to multi-task

# So what's right for you?

No matter what level of automation you choose you will find that automation is a very important part of your brewery

- better control
- higher repeatability
- shorter brew day
- cost savings
- operator efficiencies
- better ability to do what you love: craft great beer!

## Questions?

## Contact Info

Kevin Weaver

kweaver@brewmation.com | 845.765.8395

Brewmation.com

Brewmation

BYO NANO CON ONLINE