



The Quality Monitoring Tool

for Every Brewer's Tool Kit

Anecdotes from craft brewing booms of the past (c.1997) identify poor quality as a root problem leading to market contraction. While overall quality is shaped by a bevy of factors (ingredients, process, tools, and sheer artistry of the brewmaster), one common element of outstanding craft brewers who survived the bust is a commitment to controlling, measuring, and improving factors that influence end-product quality. Utilizing Good Manufacturing Practices (GMPs) and process management principles, craft brewers can reign in variability and process deviation to ensure consistently high-quality outcomes. This is a lesson learned for craft brewers rocketing to success in the modern craft brewing boom.

Craft Brewing Conference (2014) attendees may recall the State of the Industry presentation in which Brewers Association Director Paul Gatza highlighted major concerns for craft brewers, citing the fundamental tenets of craft brewing: quality, quality, and last but not least, "QUALITY". Industry leadership is driving home the importance of striving for and sustaining quality in the craft brewing business, and the effects of that campaign have taken hold in the current generation of quality-focused brewers. The Brewers Association's Quality Priority Pyramid lays down GMPs and Hazard Analysis and Critical Control Points (HACCP) principles as fundamental bases for a formal quality program within a brewery. At the heart of CGMPs and HAACP are established, monitored, and controlled sanitation procedures. Lack of sanitation poses a direct threat to the physical, microbiological, and flavor stability of each brewed batch.

A lot of consideration goes into selecting the right mix of detergent, sanitizers, automated washing equipment, and manual tools that are unique to each brewery, canner, or bottler depending on their equipment, recipes, and other needs. What's most important in the selection of the right materials and tools is how they will affect the final product outcome. Are the tools, detergents, and techniques effectively removing product residue and preventing cross-contamination risk? To answer this question, breweries of all sizes and formats utilize handheld monitoring technology which quantifies bioburden in seconds.

Image source: Twitter
@BeerAdvocate
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WHAT IS ATP TESTING?

ATP (adenosine triphosphate) is the energy molecule found in all living things. After proper and thorough cleaning, traces of ATP should be greatly reduced if not entirely removed from a surface or water sample. Accordingly, ATP sanitation monitoring is an ideal tool for measuring the effectiveness of cleaning.

An ATP system consists of three parts: sample collection devices, a luminometer, and data analysis software. The pen-sized sample collection devices for surfaces or water samples contain bioluminescent reagents which react with ATP in a sample to emit light. That light is measured in a portable, handheld instrument called a luminometer. The amount of light measured is directly proportional to the amount of ATP in the sample and is expressed as a measure of Relative Light Units (RLU). Results can be analyzed and archived in data analysis software which enables trending of results over time and greater insight into sanitation controls.

INDUSTRY ACCEPTED CRITICAL LIMITS

Setting tolerances, or critical limits, for ATP residue in a sample is fundamental in establishing a sanitation monitoring program. Results greater than the upper limit indicate corrective action, such as re-cleaning, should occur. Like the rest of the food and beverage manufacturing industry, brewers use industry-accepted critical limits of 10 & 30 RLU.

<10 RLU = Pass : Surface was cleaned thoroughly

10-30 = Caution : Surface may require targeted re-cleaning, especially for higher risk surfaces

30+ = Fail : Cleaning process failure. Sanitation should be repeated and samples retested until a Pass score is achieved.

The technology is called adenosine triphosphate (ATP) bioluminescence and works by collecting a sample in a swab device and illuminating any collected ATP with a firefly-enzyme reagent, then measuring that light in a small portable meter. This technology has been adopted to help prevent, investigate, and provides assurance against quality issues in the various operations presented below. (See page 1 sidebar for more details).

Setting Up a QC Program from Scratch

For brewers like the quality-obsessed duo leading Alementary Brewing Co in Hackensack, New Jersey, incorporating an ATP sanitation monitoring system into their new brewery's quality control procedures was a requirement – no questions asked. Co-owner Michael Roosevelt, PhD recalls, “when we started planning the brewery, one of the first things we knew we needed to have was a full lab for all QC and microbiological analysis. So in doing our research on what successful breweries do, ATP testing was one of those things we felt was foundational in a QC program. We realized we needed to do that right away.” Roosevelt looked to resources from the American Society of Brewing Chemists (ASBC), industry webinars, and conference proceedings to seek guidance on best practices for laboratory set up, then approached the use of those tools as any trained molecular biologist would. “Even before we made our first batch, we did a full passivation of the system plus a full Clean-in-Place (CIP) cycle. That was our first opportunity to test out the UltraSnap surface ATP and AquaSnap water ATP tests – and set an expectation for our pass and fail tolerances,” explained Roosevelt. Once the brewery was up and running, Roosevelt's inspection strategy shifted to a seek and destroy methodology. By selecting swabbing sites within the tank where the automated washing system is most challenged to reach, the ATP system can put the weakest link to the test, ensuring even the hardest-to-clean sites are consistently being addressed. Using a municipal water source for the rinse step at the end of the sanitation run, Alementary uses AquaSnap water ATP tests as assurance that the city's water supply is relatively clean (below industry-acceptable critical limits for ATP levels – see page 2 sidebar) and not contributing any detrimental contamination. By validating sanitation protocols and monitoring for unexpected contaminants in rinse water, the ATP test results instill confidence in the entire cleaning process. Staying vigilant is a part of Alementary's long-term commitment to immaculate sanitation as a factor of quality. Roosevelt adds, “I'm always going to be looking for how to improve this program by adding in more sampling locations or rotating in additional sites in each kettle.”

SUGGESTED TEST POINTS

Production

- Bright tank
- Sour tank
- Mash tun
- Lauter tun
- Brew kettle
- Fermentation tank
- Inside manway door
- Sample port
- Racking port
- Racking arm

- Racking head
- Gaskets
- Stand pipe
- Hose

Packaging

- Fill tubes
- Jetter tip
- Filler valve
- Racking head
- Crowner head

- Bubble breaker
- Tulip
- Seamer rolls
- Vent tube
- Undercover gasser
- Crowner element
- Filler head
- Keg filler
- Bottles
- Caps



Investigating New Challenges

For established brewers, overcoming challenges introduced by new equipment can threaten to disrupt the quality status quo. Nashville's Black Abbey Brewing Company identified its need for an ATP sanitation monitoring system to investigate quality issues during the transition to higher-capacity equipment. "We wanted to make sure we had good quality processes in place for everything – starting with making sure the tanks were cleaned and properly broken down before beer even goes into them," explained owner John Owen. "I felt like we were doing a pretty good job of it, but just eyeballing it - it can be hard to tell. We wanted to have something that could give us proof that we were doing a good job."

BY PREVENTING A SINGLE BAD BATCH IN EVEN SOMETHING AS MODEST AS A 5-BARREL SYSTEM, THE ATP SYSTEM PAYS FOR ITSELF IN ONE AVOIDED INCIDENT.

After what is typically a 4-hour sanitation process, tanks at Black Abbey are put to the test with UltraSnap surface ATP tests, checking at least six different locations in each tank.

"What it has taught us is that

there are a couple areas that even though they looked clean – and it looked like we were doing a good job – we really needed to spend a little extra time on it," adds Owen. Particularly troublesome areas for some brewers include sediment-heavy locations such as the racking arm and racking port. Identifying those troublesome areas and using the ATP system to investigate the effectiveness of cleaning interventions allows brewers like Black Abbey to establish validated protocols that can be proven on the spot. While adding an additional step to an already laborious sanitation protocol may seem daunting, the ATP test results offer peace of mind in knowing processes are solid and brewing crewmembers are reassured by the instant proof of their efforts. "It just goes to show that even though the tank looks good, it doesn't mean it is. [The brewing crew] like the fact that when they take a reading and it comes in under 30 RLU, they know they did a really good job."

From the big-picture perspective as an owner, Owen sees the ATP sanitation monitoring step as a small investment that pays major dividends. "It does take some more time and cost a few more dollars, but at the end of the day it's cheaper than dumping a bunch of beer. If this saves me from having to dump any beer at all, it makes sense. I know it's something I should be doing." In fact, the small cost of the equipment and consumables for a regular ATP sanitation monitoring program pales in comparison to the value of product at risk in a single tank. By preventing a single bad batch in even something as modest as a 5-barrel system, the system pays for itself in one avoided incident. For brewers with even more at stake, the return on investment is a no-brainer.

ATP TEST FORMATS

For surface samples:

UltraSnap

Surface ATP Tests
(Part No: US2020)

For water samples:

AquaSnap

Water ATP Tests
(available in two formats*)

Total ATP

(measures both microbial and non-microbial ATP)
(Part No: AQ-100X)

Free ATP

(measures non-microbial ATP)
(Part NO: AQ-100FX)

The difference between Total and Free ATP provides an estimate of microbial load in a sample.



Keeping Pace with Rapid Growth

During their move to a new location with increased production and more employees, Night Shift Brewing in Everett, Massachusetts needed a simpler way to monitor their sanitation regimen that was faster than full microbiological plating. Director of Quality Matt Eshelmen notes, “Using traditional plating techniques, we don’t get results for 3 - 7 days, depending on the microbe. This is too long to wait when we need to know if we can fill a tank that day. ATP testing provides us with reassurance that our sanitation regimen was successful while we wait for the results from our plates.” Referred to ATP sanitation monitoring by their canning partner, Night Shift’s brewers now use the system in various applications within their ever-growing facility. UltraSnap surface tests are used most on fermenters, bright tanks, and kegs. The AquaSnap water tests estimate microbial load in a CIP rinse water samples at the end of the cleaning cycle. With a nearly-instant turn-around time, brewers can quickly know the answer to “Can I fill this tank right now?” In a production environment requiring rapid turn-over, knowing cleaning has worked right away has been key to Night Shift’s productivity.

Taking Sanitation Monitoring on the Road

Mobile canners like Iron Heart Canning out of Manchester, New Hampshire are constantly on the offense against cross-contamination. To prevent any issues, Iron Heart uses ATP sanitation monitoring to make sure any residue from a previous run doesn’t contaminate the next brewer’s canned product. Mobile canner and bottlers provide a convenient service to microbreweries seeking to put their product into consumer’s hands while avoiding the investment. As Operator Mark Bowker explains, “to fully implement a canning system, it costs a lot more than if you hire someone to come in who has the expertise and equipment, and has nailed down the CIP procedures”. As part of their procedures, Iron Heart runs a full CIP cycle before and after every run. ATP sanitation monitoring is performed right before any product goes through the system to ensure the equipment is as sanitary as possible. Being able to show clients this proof of sanitation offers on-the-spot assurance. From an operational perspective, Bowker comments “as a growing company, we are integrating ATP testing to verify our procedures and make sure that critical product points are sanitary and we have a record of that.” By ensuring their equipment is as clean as possible, Iron Heart can virtually eliminate the liability of cross-contamination between runs.

CONTRIBUTOR PROFILES

Alementary Brewing Co

www.alementary.com

Hackensack, NJ

- 4,000 bbl
- 3,600 Sq ft

Black Abbey Brewing

www.blackabbeybrewing.com

Nashville, TN

- 4,000 bbl
- 10,000 Sq ft

Night Shift Brewing

www.nightshiftbrewing.com

Everett, MA

- 8,000 bbl
- 32,000 sq ft

Iron Heart Canning

www.ironheartcanning.com

Manchester, NH

- 6 mobile Wild Goose 250 units serving New England



Resources to Brewers for Getting Started

Like many of the breweries featured, brewers and mobile packagers have found ATP sanitation monitoring out of necessity to solve or prevent quality issues in their production processes. Anticipating these universal needs for quality best-practices, the ASBC maintains an encyclopedia of manuals, calculators, training resources, and documentation in its Methods of Analysis, available online. ATP sanitation monitoring is specified in Microbiological Control methods 1 ([Aseptic Sampling](#)) and 6 ([Water and Rinse Water Hygiene Using ATP](#)). More resources, research, and industry case studies are constantly churning out of the industry as the volume of craft brewers grows and quality persists as a critical factor to brewery success. Though many factors contribute to a brewery's total quality, ATP sanitation monitoring has proven to be a critical tool in the tool chest for brewers of all sizes.

About Hygiena

Recognized worldwide for accuracy, ease of use, and affordability, Hygiena's ATP Sanitation Monitoring System is used extensively throughout food and beverage industries to validate sanitation protocols and determine whether equipment is truly clean. The EnSURE Monitoring System measures ATP from surface and liquid samples. For more information about Hygiena and to read case studies from breweries around the globe, visit www.hygiena.com/beer

