Environmental Impacts on Brewing and the Resulting Sustainability Efforts at a Commercial and Industrial Site.

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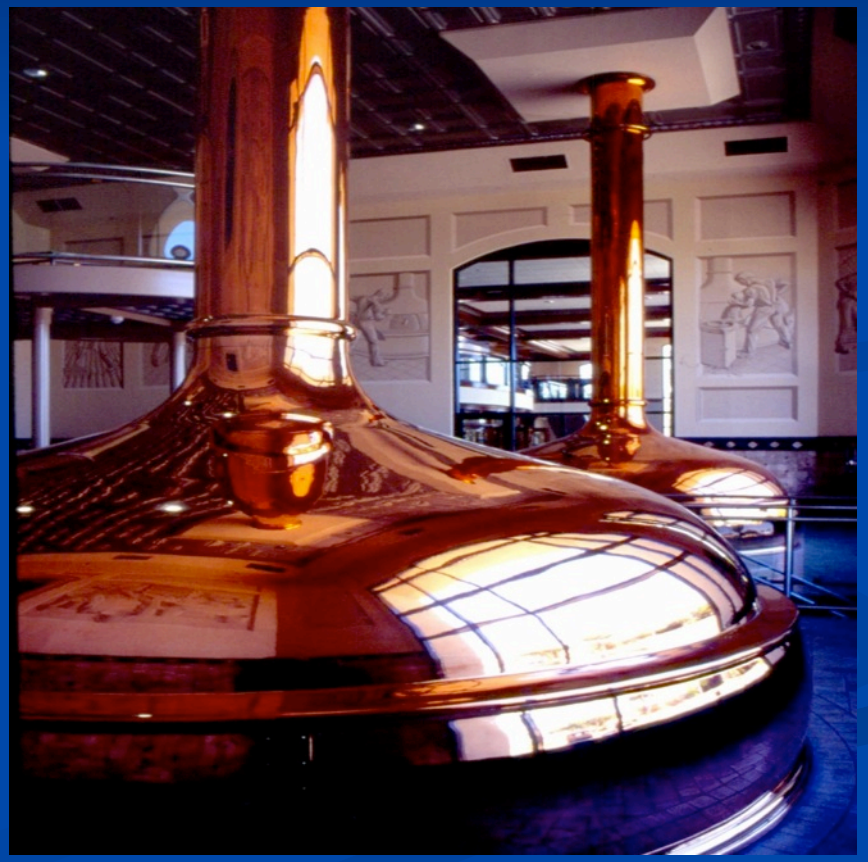
- MBAA NW – 4/26/2013



Sierra Nevada in 2012

- 899,000 Barrels Produced in 2012.
- 12% increase from 2011.
- Over 500 Employees.
- 6th largest brewery in the U.S. (Depending on who you talk to.)
- Waste Water Treatment on-site.
- Restaurant-Pub on-site.
- Big Room Event Hall on-site.

Before I Start

- I am hopeful that each and every one of you can take a few tidbits from this and apply it to your existing process
- I am also hopeful that, as you grow your business, that some of this information will be helpful.
- I also realize that my brewery is considerably larger and has more experience in these areas.

Environmental Impacts on Beer Production

- Water Availability and Cost.
- Raw Material Agricultural Status by Year.
- Natural Gas Costs.
- Electricity Costs.
- Waste Disposal.
- CO2 Use and Disposal (Green House Gas).
- Transportation Costs.

Brewing is Energy Intensive

- Steam
- Water
- Chemicals
- Waste
- Raw Materials

Brewing is Energy Intensive

- CO2
- Compressed Air
- Electricity
- Transportation

Steam and Heat Recovery

- Kettle Heat is a great source of heat for water applications.
- There is a considerable amount of heat generated from Refrigeration Systems.
- Heat from Hydrogen Fuel Cells used to heat Boiler Condensate.
- Consider Heat Sources to heat Condensate.

Water

- Source is Critical.
- Measurement is the key to Conservation.
- In Brewing, what comes in minus product and evaporation, is what needs to be treated.
- Identification of large water usage processes will reduce incoming and treatment volumes.
- Employee Education Always Helpful.

Utilities

- Steam (Brew house, CIP, Cleanup)
- Natural Gas (Boilers)
- Compressed Air (Valves, Instruments, Grain Delivery, Grain Disposal)
- Refrigeration (Tank, Beer Chilling, and Warehouse)
- CO2 (Beer Push and Carbonation , if you do not bottle condition.)

Waste

- Spent Grain/Hops
- Spent Yeast
- Cardboard
- Glass
- Wastewater
- Employee Waste
- Beer Loss

Beer Loss

- Starts with Knock-out Volumes
- Known Wort Quantity Exiting the Brewhouse
- Dependant on Flow Meter Location
- Monitoring of Yeast Disposal (Quantity of beer in yeast)
- Beer in/ Beer out in Filtration.
- Beer Recovery in Filtration from Tank Bottoms.

Beer Loss

- Beer Introduction to Packaging
- Beer Transfer Accuracy to Specs
- Specs – CO2, Alcohol, Gravity, DO
- Bottle Filler Accuracy of Specifications
- Racker Accuracy of Specifications
- Can Line Accuracy of Specifications.

Keeping it Sustainable

- Viewing Waste Streams as Commodities.
- Looking for "Looped" Systems.
- Material Reuse.
- Water Conservation.
- Understanding how the Systems Relate.
- Employee Education.

Looped Systems

- Biogas Looped to the boilers to reduce natural gas usage.
- Spent grain fed to the cows used in the restaurant.
- Food waste composted and used in the garden supplying the restaurant kitchen.
- Cold Liquor looped to a vapor condenser fed by the kettles to heat brewing water.

Looped Systems

- Bottle Conditioned Warming in Filtration uses a combination of pre-heated Hot Service Water and Cold Liquor to achieve desired beer temperature.
- Resulting tempered water is returned to Hot Service for re-heat.
- Water volumes are not reduced during bottle conditioning warming.
- Bottle rinser water used for vacuum pump cooling.

Material Re-use

- CIP solution re-use.
- CO2 Capture and Re-Use. No Need for Purchase of CO2. (Note: Pencils out at about 300K Barrels.)
- Restaurant grease manufactured into bio-diesel for local truck route. (Consider the Fish & Chip Approach)
- Much of the "looped system" approach requires material re-use.

Relating Systems

- Much of the brewing operation is inter-related.
- The heat sources are key to recovery and re-use.
- Waste can be viewed as a commodity.
- CIP waste captured for waste water pH adjustment via Neutral Tank.
- If no Waste Treatment Facility, consider neutral water disposal.
- Identifying waste source and re-use.

Water and Waste Water

- The next set of slides will discuss SNBC's Water and Waste water Systems and Conservation Efforts.
- This discussion is designed to assist brewers in finding applicable water conservation ideas.