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Hopworks Urban Brewery: A Case of Sustainable Beer

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Hopworks Urban Brewery: A Case of Sustainable Beer

Free Online Copy

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Hopworks Urban Brewery: A Case of Sustainable Beer

Abstract

Founded in 2007 in Portland, Oregon, Hopworks Urban Brewery is a sustainability-focused brewpub that produces certified organic beer. The State of Oregon is the second largest producer of hops, a main ingredient in beer, in the United States, and also has more craft breweries per capita than any other state. The metro area of Portland, home to over 2 million people, has over 84 craft breweries within its borders.

The craft brewing industry has grown rapidly in the United States over the last decade, with an annualized growth rate of 9.6% from 2009–2014 and a \$14.3 billion market in 2013. Craft brewers are small enterprises, producing fewer than six million barrels of beer per year, employing both traditional and innovative brewing methods, and focusing on quality products and connecting with their local community.

To date, Hopworks has thrived in this competitive environment, producing over 12,000 barrels of beer per year while staying carbon neutral and diverting 98.6% of their total waste from landfills. Hopworks' top quality beers have won prestigious national awards. Additionally, Oregon's Governor has honored the brewery for its achievements as a sustainable business. However, to expand, Hopworks is faced with a number of key decisions that affect its sustainability both economically and ecologically. Christian Ettinger, founder and brewmaster of Hopworks, must make strategic decisions about capital investments, labor allocations, and even the future of their organic certification as he executes a growth plan in line with their sustainable values. In this case, students will be challenged with analyzing all aspects of a sustainability-focused business and considering the many choices a craft brewer, or any small business owner, faces.

Hopworks Urban Brewery: A Case of Sustainable Beer

“Use the brewery as the means to change the world.”

Christian Ettinger, Founder, Hopworks Urban Brewery

On a windy fall day, Hopworks Urban Brewery’s Founder and Brewmaster, Christian Ettinger, sat in a lofted conference room overlooking brewery operations and listened to a local company pitch new brewery management software, but his mind was elsewhere. It was lunchtime, and beneath the meeting room, the brewpub restaurant was full, packed with families thanks to a no-school day. Children of all ages covered the play area and spilled out from under booths. The kitchen was working hard to keep Hopworks’ 200 dining customers happy, however young or old. Ettinger knew he needed the software being pitched to him. It seemed almost unbelievable to him that in seven short years, Hopworks had grown to the point where it now needed that type of technical infrastructure. On his mind, aside from details like software, was the new 5-year plan Hopworks was implementing that called for tripling three categories: revenue, locations, and brewing capacity. Ettinger knew these were inextricably tied together; 70% of Hopworks’ revenue came from on-premise sales, while wholesale accounted for only 30%. However, the profit margins on these two distinct areas of their business were wildly different; the restaurant’s margin was 5%, compared to the brewery’s 25%. What did this mean for their hope to expand, and how could they do so sustainably?

Hopworks valued sustainability for its environmental benefits, but Ettinger knew firsthand that economic and social sustainability were also a key part of the equation. If you go out of business, you can’t continue doing good in your community, and your environmental impact is irrelevant. He was committed to sustainable growth in both senses of the word. How could Hopworks keep its commitment to produce the best, most sustainable beer? They were at a turning point, facing intense pressure from Portland’s 83 other craft breweries¹, and needed to expand operations to increase revenue and maintain their leadership position. But what was the best path forward in line with their values? Ettinger reflected on what it was like when he was starting Hopworks over seven years ago, and tried to channel that younger, perhaps more idealistic, brewer for guidance. But how would he know what was right for Hopworks today?² More specifically, some of his major decisions included:

- What kind of equipment or software was needed to continue to grow and run as sustainably yet profitably as possible?
- Should he pursue two new brewpub locations?
- Could they distribute their wholesale products more widely without increasing their carbon footprint significantly?
- Should they replace or augment their organic certification with other certifications like Salmon Safe?
- Overall, how could Hopworks balance their ideals with a continued commitment to making the best beer, while staying economically sustainable as well?

Company History

Ettinger founded Hopworks Urban Brewery (HUB) in 2007 with sustainability as its core mission and differentiation strategy from the beginning. His vision was to produce world class, organic beer with fresh, local ingredients in an eco-friendly, sustainable building that would serve as a gathering point for the community. Seven years later, his dream flourished in the original brewpub in southeast Portland and the Hopworks BikeBar in northeast Portland. Portland is well known as the U.S. city with the most microbreweries per capita: 84 total within the metro area, according to the Oregon Brewer's Guild.³ By 2013, Hopworks was the 11th largest producer in Oregon⁴ out of more than 170 craft breweries in the state.⁵

Ettinger's passion for brewing started well before the recent explosion of the craft beer market in the United States. The son of a German architect and a mother who worked at a local private university, Ettinger was allowed to sip from the keg while conversing in German with professors visiting as part of German exchange programs. In college, Ettinger spent a year in Cologne, Germany, home of Kölsch beer, as part of a business degree, and says that immersion in Germany's rich brewing culture "changed [him] forever."⁶ After attending brewing school at the American Brewers Guild, he started out washing kegs and brewing beer at other local breweries, before going on to help launch Laurelwood Brewing Company in Portland in 2000.⁷

Hopworks' brewery started production in 2007 as Ettinger and crew refurbished an old building to house a brewpub on the premises. The 16,800 square foot building, constructed in 1948 as a showroom for Caterpillar bulldozers and then repurposed as Sunshine Fuel headquarters, was a concrete shell filled with cubicles and drop ceilings when Hopworks acquired it. While full demolition would have been cheaper, with his background in construction, Ettinger decided instead to deconstruct the old building to serve as a sustainability showcase. In this way, Hopworks' foundation is both literally and metaphorically sustainable, a key demonstration of their commitment to sustainability from the beginning.⁸

Yet to Hopworks, sustainability was more than making ecologically responsible decisions. They modeled an ethos of "do what you can" in actions big and small, from employees turning the lights off when they left a room, to energy-saving thermostat settings, to selling kegged local wine instead of bottled wine. In every interview, potential employees were asked what sustainability means to them, and Nate Young, Director of Sustainability, reported that company awareness of sustainable practices was high enough that he'd discussed them with nearly everyone, including a 17-year-old busboy with an after-school job at the brewpub. This culture earned them an accolade as one of the 100 Best Green Employers in the State of Oregon for 2013⁹, as well as the Governor's Oregon Sustainability Grand Champion Award.¹⁰

Social sustainability was also important set of values for the company. Some might argue that alcohol itself has negative consequences for society related to alcoholism, addiction, and anti-social behavior. Others would claim that the pub has always been an important social place in many communities. In that respect, community was a cornerstone of Hopworks' values. When naming the brewery Hopworks Urban Brewery, or HUB, Ettinger thought of the "most important mechanical invention of the modern world — the wheel — with the middle of that being the most important part of the wheel. Then the metaphors are a mile deep: pizza, cycles of carbon, oxygen and water; the way the spokes radiate from the middle, of which the middle is the heart or the town hall, the social center, etc."¹¹ Hopworks strove to produce the best, most sustainable beer, but also to do the most good in the community. Their brewpubs were designed to be a central meeting spot for the neighborhood, the sought-after "third place" between work and home, featuring a children's play area and a free, bi-weekly story time for toddlers.

In an effort to keep their beer as fresh as possible and minimize carbon emissions from transport, Hopworks only distributed beer by truck in the Pacific Northwest, and used rail to ship farther afield. This effectively ruled out export markets and parts of the U.S. not connected by a hub-and-spoke system that could easily move containers from train to truck. Sticking to local distribution harkened back to a time when all beer in America was craft beer, brewed locally.

Craft Brewing History

Before the age of mass production and refrigerated delivery trucks, all of the beer brewed in America was, technically, craft beer.¹² American craft brewing enjoys a storied, colorful past, and Ettinger loved to share facts about the history of brewing with anyone willing to listen. He contended the Mayflower landed when and where it did only because ship was running low on beer, the only safe liquid to drink at sea. According to Mayflower Brewing, “Men, women and children drank beer daily, and sailors aboard the Mayflower received a daily ration of a gallon.”¹³ Regardless of the veracity of this beer folktale, Ettinger and many other craft brewers reveled in the history and traditions surrounding America’s brewing heritage.

America boasted a pre-prohibition total of some 4,000 craft breweries, which consolidated as the industry modernized.¹⁴ By 1976, there were only two craft breweries in all of North America.¹⁵ However, the pendulum soon swung in the opposite direction, with 1,370 craft breweries in the United States alone by the late 1990s.¹⁶ A major catalyst of this revival can be found in the 1978 passage into law of House Resolution (H.R.) 1337 by President Jimmy Carter. The legislation made home brewing legal in the United States, creating room for small brewers.¹⁷ “As a result of this new freedom, successful home brewers ramped up their production and eventually formed the beginnings of what is now considered the modern craft beer industry.”¹⁸

Yakima Brewing and Malting Co. became the first brewpub in the U.S. in 1982¹⁹ (a *brewpub* is defined as a restaurant/brewery that serves its own food and its own beer on premises). The first generation of Portland craft breweries, Bridgeport, Widmer, McMenamins, and Portland Brewing, were able to open for business after an Oregon law permitted brewing and retail sales on the same premises.²⁰ As of 2014, there were 84 breweries operating in Portland, the most breweries of any city in the world.²¹

Breweries in the Pacific Northwest were advantageously located in close proximity to some of their most important suppliers. Ettinger pointed out that the region produced about 23% of the world’s hops, helping drive the quality-focused (and very hoppy) craft brewing movement in Portland. The Northwest produced nearly all commercially used hops in the United States: approximately 30,600 acres in Washington, 6,400 acres in Oregon, and 3,900 acres in Idaho. The region was also a major producer of barley, with roughly 900,000 acres in Montana, 570,000 acres in Idaho, and 235,000 acres in Washington.²² Other inputs were readily available: pure water from Portland’s Bull Run watershed, malted barley from Great Western Maltin in Vancouver, Washington, and yeast strains supplied by local labs such as Wyeast Laboratories.

The West Coast dominated the U.S. craft brewing market, with nearly one third of all craft brewing establishments. The three states with the largest share of craft breweries were California at 13.5%, Washington at 7.1%, and Oregon at 6.4%, even though Oregon and Washington combined only represented 3.4% of the total U.S. population.²³ Ettinger credited consumers in the Pacific Northwest as being early adopters, having a sophisticated palate, and making lifestyle choices to support local businesses. Connecting these three important

components of the supply chain together — ingredients, processors, and consumers — is what made it all work.

Market and Competition

According to Hopworks Director of Sustainability Nate Young, the national trend had been toward an ever-increasing number of craft breweries selling both on premises and through retail channels (see **Appendix E**).²⁴ Although craft beer was still treated as a premium product, making up only 7.8% of beer sales by volume in the United States (but over 18% in Oregon), the “Craft Beer Production industry [had] emerged as the fastest-growing alcoholic beverage industry in the United States.”²⁵ Consumption of craft beer was on the rise, with 19% annual revenue growth in the five years leading up to 2014, slowing to 7.4% forecast annual growth over the following five years.²⁶ For the first time in modern history, craft beer sales by volume had recently eclipsed sales of Budweiser.²⁷

Capitalizing on the growth in demand, the number of craft breweries in the U.S. had surged. During the five years leading up to 2014, “the total number of [craft brewing] industry enterprises increased by a 9.6% annualized rate to 2,619,” generating an estimated \$4.2 billion in revenue.²⁸ By mid-2014 the number of active brewery permits topped 4,500,²⁹ including small breweries with hardly any distribution. Market share concentration in the industry was also low, “with the top four players accounting for about 34.3% of total industry revenue in 2014.”³⁰

With such a large number of small players, the industry was ripe for consolidation. “Merger and acquisition activity [had] begun to occur within the industry, notably with the foundation of the North American Breweries parent corporation and its acquisition of Pyramid Breweries and Magic Hat Brewing Company in 2012.”³¹ Anheuser-Busch Inbev’s 2014 purchase of 10 Barrel Brewing in Bend had brought the acquisition trend home to Oregon.³² Ettinger felt this had been driven by 10 Barrel’s alleged 25% year-over-year growth rate, which he believed might lead to challenging production economies and lower quality. Because brewery capacity is typically purchased in large increments, the full production capacity needs to be utilized, and that sometimes necessitated reducing prices (or input costs) to move more beer. Otherwise, a brewery would need a capital infusion to expand marketing and distribution.

Acquisitions were not the only way that major beer brands capitalized on the craft brewing craze. In an effort to fight back and cash in, they started marketing their own craft beer lookalikes. MillerCoors produced Blue Moon, a wheat beer, and Anheuser-Busch Inbev was the maker of Shock Top Belgian White, although the producer’s name was intentionally left off of the label.³³ In response, craft brewers had to work harder to set themselves apart from corporate brands. “Branding and packaging, including logo design and labeling, are essential to convey the uniqueness of craft beer.”³⁴

Competition was likewise fierce between craft breweries. During a tour of the Hopworks facility, Young commented that it seemed like a new craft brewery opened up almost every week, competing directly with Hopworks for valuable retail shelf space.³⁵ To mitigate competitive pressure in retail channels, Hopworks effectively leveraged on-premise sales. While on-premise sales had lower margins, it avoided the three-tiered distribution system required by law in most states for off-premise sales. These three tiers, a holdover of early post-prohibition laws, were the brewery, distributor, and retailer. Brewers were allowed a small amount of self-distribution below a certain level of production. Beyond that, all sales had to occur through a distributor, and then through a retailer, before reaching the end consumer.³⁶ Some larger craft breweries, in order to increase geographic reach and lower distribution costs, had recently opened brewing operations on the other side of the country. New Belgium Brewing of Fort Collins, Colorado, and

Sierra Nevada of Chico, California had both opened new breweries in Ashland, North Carolina to serve the eastern US market.³⁷

Between craft brew lookalikes offered by major brands, a rapidly expanding number of local craft breweries, and economies of scale that favored large-scale production, national distribution, and the need for investment to fuel both, Ettinger's focus on local, sustainable beer seemed under fire from all sides. However, there was a countervailing force among consumers of craft beer: most preferred to drink from local breweries.³⁸ In addition, more than 38% of American consumers said they purchased green products regularly or almost always, an increase of six percentage points over 2012.³⁹ Clearly, Hopworks' focus on sustainable, local beer fit emerging consumer trends.

Sustainability in Craft Brewing

Craft brewers by definition are smaller brewers, and they need to survive and thrive in the face of capital constraints. With less capital to invest, brewers have been forced to look for innovative and progressive ways to increase efficiencies and cut costs while maintaining the integrity and quality of their craft brews. Resource use is one key focus area for achieving both cost reductions and competitive differentiation.

Beer Brewing Process

The process starts with malted barley; this barley has been soaked in water to allow partial germination and then kiln dried and roasted to stop the germination. In that process, enzymes are developed that will later help convert the grain's starch into sugar. In the brewery, malted barley is milled or crushed into small pieces and then mixed with warm water to steep for an hour or so in a mash tun. After all the starch has converted to sugar, the liquid "wort" is drained into a brew kettle where hops are added as the wort boils to add the aromatic and bitter flavors (the leftover grain from the mash tun is now a by-product of the process). After boiling for an hour, the liquid is cooled and transferred into a fermenter where yeast is added. The yeast gets to work converting the sugary liquid to alcohol and carbon dioxide. When fermentation is complete (a week or more depending on the style), the beer is typically filtered and transferred to a "brite" or conditioning tank where the beer sits until ready to serve. At that point, the beer can be either be served directly to the pub or packaged into kegs, bottles or cans (See **Exhibit 1: Brewing Process**).

Energy Use

Breweries use electrical energy to power equipment and for refrigeration, while thermal energy, in the form of natural gas, is consumed for brewing. On average, thermal energy accounted for 70% of a brewery's energy use, but only 30% of the energy cost.⁴⁰ This usage/cost breakdown indicated reducing electrical energy consumption was a major area of opportunity to reduce costs. Reducing electrical energy also had the added benefit of reducing greenhouse gas emissions.

Industry practices to reduce energy usage varied from low cost options like use of CFL or LED lamps, to moderate cost options like the purchase of ENERGY STAR equipment, to major cost options that could take more than 3 years for payback, such as installation of a refrigeration chiller (See **Exhibit 2: Estimated Equipment Costs**).

Water Usage

Water is a vital component of beer production, and use and disposal of water can be a large expense for craft brewers. Beer is made up of 90% water, and with the cost of municipal wastewater treatment rising in many areas,⁴¹ breweries increasingly sought ways to improve

water efficiency and reduce wastewater. Inefficient operations could consume up to 20 gallons of water per gallon of beer produced.⁴² At the opposite end of the spectrum, Full Sail Brewery, often recognized for its comprehensive and innovative sustainability policies, used as little as 3.45 gallons of water per gallon of beer produced.

One method for reducing wastewater was through the use of anaerobic digestion systems or aerobic treatment. Aerobic treatment removed organic content through separation and composting, while anaerobic digestion produced methane in an oxygen-free environment. Sierra Nevada and New Belgium benefited from incorporating these systems into their production, with the methane produced as a by-product recaptured to power boilers.⁴³

Gas Recovery

Although CO₂ is a naturally occurring gas generated during the brewing process, most breweries make no attempt to recapture it, but instead purchase tanks of CO₂ to carbonate, bottle, or keg beer. In 1998, Alaskan Brewing Company in Juneau was one of the first breweries in the U.S. to install a CO₂ reclamation system. The system captured greenhouse gases produced during fermentation and re-distributed it in other production functions. According to Alaskan Brewing, “this system saves approximately 800,000 pounds of CO₂ from being released into the atmosphere each year.”⁴⁴

Solid Waste

Spent grains, a byproduct of the mashing process, are the largest source of waste for most brewery operations. Although considered ‘waste’ at this point, spent grains are still rich in protein and fiber, and were commonly donated or sold as animal feed. Consolidation of cattle to select geographic regions, however, was a limiting factor for some craft brewers given the potential for spoilage in transporting these grains long distances.⁴⁵

A common waste Key Performance Indicator (KPI) referred to the overall waste that was diverted from a landfill, called a Diversion Rate. However, brewing involved such a high volume of spent grain and yeast that it could mask the diversion of other materials. Because of this, craft brewers established a separate diversion rate that excluded spent grain and yeast.⁴⁶

Hopworks’ Decision-making Process⁴⁷

Hopworks’ 20-barrel breweryⁱ was operating at maximum capacity during their busiest time of year. The average craft brewery produces about 700 barrels per year, and Hopworks was up to 12,500 barrels.⁴⁸ Hopworks had done all of this while maintaining not only a level of quality that gained them prestigious awards such as two gold medals at the Great American Brewers festival, but also a commitment to being the most sustainable brewery possible. Their beer was certified organic, no small feat considering the hefty price premium and availability constraints of organic hops. They had set a goal to become zero-waste and in 2013 managed to divert 98.6% of their total waste, including spent grains. The brewery was completely carbon-neutral. Hopworks considered the impact of every decision they made, down to the sourcing of local, cage-free chicken. Their decision process of sustainability investments had evolved over time as shown next.

“Good, Better, Best”

When Hopworks first started, they were confronted with a variety of sustainability options, from good, to better, to the best that money could buy. The company carefully assessed which option would generate the best environmental or social outcomes, would provide the best payback on

ⁱ One Barrel = 31 Gallons = 1.17 Hectoliters; 20-barrel brew house is the batch size

investment, and was most affordable at the time. Ettinger knew that overspending on these initiatives could put the brewery out of business. “The low hanging fruit,” he said, “is what we shoot for out of the gate... and anything that pays for itself in 12 months is pretty rare, but we jump on that pretty quickly.”⁴⁹

From “Gut” to “Pro Forma”

Making decisions informed by a balance of reason and analysis came from a lesson the company learned early on, when they made a “gut” decision to use biodiesel to heat their water boiler. As a cleaner fuel alternative, there were clear benefits to sustainability, and the company could tout the approach in its marketing. However, Hopworks quickly learned this cleaner fuel was too expensive, and the brewery was forced to discontinue use of biodiesel altogether.

Breakeven Analysis

The financial metrics that Hopworks used to evaluate projects were typical of many small businesses. A simple payback period was calculated, and any project providing less than a seven-year payback would be considered. If a project could not surpass the payback hurdle rate, then Hopworks would look at associated brand benefits or try to calculate indirect labor cost savings. For example, when LED lighting was considered for the bar, the project couldn’t hit a seven-year simple payback hurdle until indirect labor costs were included. Because LEDs last so much longer than other types of lighting, less of the manager’s time would be spent changing light bulbs — a cost savings that helped push the project over the hurdle.

Hopworks does not use other, more sophisticated financial metrics such as Net Present Value (NPV), Internal Rate of Return (IRR), or Modified Internal Rate of Return (MIRR) to evaluate projects unless a bank requires their use as part of a loan. As with any small business, most employees fill many different roles at the company and there is a limited amount of time for financial analysis.

Water and Energy Use

Hopworks’ water, electricity, and gas usage per unit of production for 2011–2012 are graphed in **Exhibits 3-5**. Averaging 7.6 gallons of total water used on site per gallon of beer produced, Hopworks was on a slight, yet encouraging, downward trend for water usage (**Exhibit 3**). Electricity and natural gas usage per barrel produced followed similar downward trends even as production ramped up 16% year-over-year (**Exhibits 4 & 5**). Managing the cost of water and energy was an important part of Young’s job as Director of Sustainability. Increased operating efficiency was the result of continuous energy improvement practices, and if left unattended, costs could spiral out of control. Lacking the scale necessary to support larger infrastructure projects, such as bio-digesters, Hopworks had to maintain focus on the most cost effective solutions for their current production levels.

Brand Benefits

Internal research showed that one third of Hopworks’ customers selected the brand because of the company’s commitment to sustainability. This was an important element of Hopworks’ competitive differentiation, and the company aimed to make daily decisions about sustainability and to talk about these practices publicly. For example, Ettinger encouraged other brewers to brew at least one certified organic beer to drive market adoption of organics in general and to expand the supply base of raw organic ingredients.

As a counterexample to sustainability-led branding, Young pointed to Sierra Nevada, widely considered one of the most sustainable breweries in the United States. However, sustainability was not a major part of their marketing message. This would seemingly reduce the number of

customers selecting the brand based on a perception of sustainability, and therefore the add-on brand benefits of sustainability investments. For a small craft brewery like Hopworks, those brand benefits, and the accompanying increase in sales and customer willingness to pay a premium, could often mean the difference between making and forgoing a sustainability investment.

Hopworks Sustainability Initiatives⁵⁰

Remodeling

Deconstruction and remodeling of the flagship brewpub was the first major sustainability decision the company faced. The new building was re-built using as many reclaimed materials as possible, a painstaking process that required sorting every piece of material by hand, from plumbing to old wood. With help from locally based Lovett Deconstruction, the majority of site materials were reclaimed and reconstructed. Old kegs served as flower planters surrounding the outdoor patio. Inside, the arched wooden ceiling was restored and left exposed, old growler bottles were used as light fixtures, and old beer bottles on the walls served as decorations. One-third of the framing, as well as the restaurant booths, trim, and the bar itself, were made from repurposed material.⁵¹

Carbon Neutral and Energy Efficient

The brewery purchased renewable energy credits (RECs) to cover 100% of its usage, and purchased additional carbon credits to offset 100% of its scope 1, 2 and 3 emissions (covering direct, indirect from purchased energy, and other indirect sources). Energy efficient equipment was installed throughout the building: L5/L8 Fluorescent light bulbs (lighting), cool-Fit pre-insulated glycol pipes (cooling), weatherization for windows and doors (insulation), and air economizers (HVAC).

Organic Certification

Hopworks is the only brewery in Oregon fully committed to organic brewing. The brewery was certified organic by Oregon Tilth, which is overseen by the United States Department of Agriculture (USDA). This certification is an internationally recognized symbol of organic integrity, requiring food producers to adhere to strict production standards that include being free of Genetically Modified Organisms (GMO).

Employee Culture & Incentives

Hopworks encouraged its employees to practice sustainability, and offered rewards to incentivize these activities. Approximately 67% of all employees used sustainable commuting methods: bike, public transportation, carpool, or foot. Quarterly raffles were offered for employees who used “active transportation,” getting to and from work through physical activity like walking, bicycling, or even skateboarding. All full-time employees were offered health insurance and earned sick leave. Although leave was required by the City of Portland, Hopworks employees could convert sick leave to paid time off, encouraging personal wellbeing.

Water Consumption

Due to committed efforts by restaurant staff and brewers, along with reconfiguration of their taps, Hopworks lowered their water use to 3.01 gallons of water per gallon of beer produced, very low by industry standards. In the brewpubs, water was served only by request, and total consumption by all operations amounted to just over “4 swimming pools’ worth” of water, offset by purchasing credits from the Bonneville Environmental Foundation.

Glycol Cooling System

In 2012, the brewery installed a glycol system used to maintain cooler temperature during fermentation (72 degrees for ales, 40 degrees for lagers) and to chill finished beers for packaging. Installation of the cooling system reduced the brewery's monthly electricity bill by 8%.

Zero-Waste

Hopworks aimed to achieve zero waste. Excluding spent grains, the brewery diverted 89% of their waste from landfills through compost and recycling. Each year, 700 tons of spent brewing grain was sent to a rancher in the Willamette Valley to be used as cattle feed. Including spent grain, their total diversion rate was 98.6%.

Bike Bar

This bicycle-friendly extension of Hopworks was housed in an eco-friendly building on one of Portland's "bike highways." Bike-friendly features included a bike frame canopy, 75 bicycle parking spaces, bike tools for use, and bicycle take-out specials. Patrons also had access to Plug-Out exercycles, stationary bicycles that generated energy when in use. The building was designed to meet "NetZero" energy standards, and was constructed using reclaimed materials from Portland's Rebuilding Center. The Bike Bar itself was an incandescent bulb free zone.

Recyclable Paktech Handles

Paktech handles are made from 96% recycled HDPE plastic, and produced in Eugene, Oregon. Hopworks used the handles on their four-packs of cans, and offered incentives for customers who brought back the handles. For every Hopworks handle returned, they gave a wooden nickel worth a quarter (\$0.25) towards a pint of beer, up to the price of a pint, or 19 handles in a single visit.

Challenges and Opportunities

The pressure to expand came from multiple related activities. As mentioned previously, the market for craft beer was growing more competitive daily. Large brands were launching copycat beers or acquiring other craft breweries, and the number of competing craft brewers in the region was exploding. As a result, shelf space in retail store was getting severely constrained. Getting a major chain store account was a major coup for a brewery but brought with it expectations to fill multiple stores with several of the brewery's packaged styles. One major chain account could double or triple production demand. Other breweries of similar size to Hopworks were expanding into the Northwest from California or Colorado. Other Oregon breweries were aggressively trying to grab Hopwork's existing accounts. Thus, the brewery could not maintain their current position without pushing back, maintaining relevancy and expanding in other territories. Throughout this, Hopworks had been able to reduce costs, build better connections to sustainability-minded local consumers, and reduce their impacts through consistent investment in sustainability and a focus on brewpub sales. Ettinger was proud of the recognition they had received both for beer quality and for their sustainability initiatives (see **Appendix A**). Yet considering the market pressures Hopworks faced, and the fact that their original brewpub was at maximum capacity, Ettinger knew the company had to make changes, both to continue their growth and their positive environmental and community impact. Otherwise, they might be completely squeezed out by their competitors.

The brewery needed to implement cost reduction strategies to become more competitive at a larger scale, especially if they moved into areas where consumers were unwilling to pay a sustainability premium. But how could they do that without compromising their mission? Hopworks had a number of options, each of which came with its own set of tradeoffs.

Ettinger had begun exploring Salmon Safe certification for Hopworks' hops. The Salmon Safe program had become one of the nation's premier eco-labels, working to preserve watersheds for salmon spawning on the West Coast from British Columbia down through California, and had a positive impact on 600,000 acres of farmland.⁵² Purchasing hops from farmers that were Salmon Safe certified but not certified organic would allow Hopworks to expand their environmental impact, and encourage and promote sustainable farming practices on a greater scale. It would also lower the cost of Hopworks' raw ingredients.⁵³ Buying certified organic hops was one of their biggest expenditures after real estate and labor; the cost premium of producing certified organic beer was about \$0.08 per pint, or up to \$248,000 per year at their current rate of production.⁵⁴ At \$12 to \$18 per pound, organic hops were at least twice as expensive as conventional hops.⁵⁵ Although organic hops were increasing in supply — production went from 0.25% of total U.S. hops production in 2009 to 1.12% in 2012 — they were still not as easy to obtain as conventional hops, despite Hopworks' ideal location near the majority of hops grown in America.⁵⁶

Would the addition of, or change to, Salmon Safe hops be perceived by their loyal customers as expanding their sustainable practices, or withdrawing on their promise to support organic agriculture? How could they balance different certifications, and would they be in line with Hopworks' values? Salmon Safe hops were more readily available, but large local competitors already used them in beer and marketed this as a sustainable practice.⁵⁷

Ettinger also considered investing in new equipment to lower costs and reduce waste. Hopworks had about \$100,000 in free cash flow available each quarter to invest, but it wasn't always clear where that should go first. The brewery management software? A centrifuge to help reduce waste, resulting in about 5% more beer per batch? What about investing in an automated brewing system, one that could both improve energy efficiency and cut labor costs — but would it be an expensive, top-line German system or one fabricated locally? A locally sourced system was much cheaper, about 20% less than the cost of German automation, and would support another local business. However, it wouldn't be nearly as efficient, so even if they broke even on the capital expenditure sooner, the long-term benefits were not the same.

Then there was the question of finding a new brewpub space. Undeniably, brewpubs made fiscal sense, bypassing expensive distribution and enabling the type of direct customer engagement that allowed Hopworks to trumpet its sustainability practices — something hard to fit on the label of a beer bottle. However, the local real estate market was heating up and Hopworks had not been able to secure the space they wanted in suburban Portland. Should they delay their next opening or compromise on a less desirable location?

If Hopworks had trouble tripling its locations, what about expanding their reach via wider distribution? Like many artisan beer producers, Hopworks started as and remained a brewpub, selling most of its product on site. The Brewer's Association classified a brewpub as a restaurant-brewery that sells 25% or more of its beer on premises. In contrast, a microbrewery focused on distribution, with 75% or more of its beer being sold off site, but with production under 15,000 barrels per year. The next tier of production was a regional brewery, with production between 15,000 and 6 million barrels per year, but Hopworks was not planning to reach that scale. Due to their focus on sustainable community, the brewpub model had always made sense for Hopworks. Plus, distribution was an expense, and one that added to their carbon footprint. Ettinger had always felt that by definition, craft brewers focused on freshness and flavor, and you can't achieve top quality if your beer is sitting in cans in a truck and then a supermarket shelf.

However, Ettinger now wondered if there were sustainable routes of distribution that wouldn't compromise the quality of Hopworks' beer or their values. Could they find an ecologically sound way to distribute? Was it economically viable? Currently wholesale only brought in 30% of their revenue, but the profit margin was higher at 25%. How would expanding distribution affect their bottom line? Beyond that, would quality and freshness be affected as he suspected it might? Distribution also meant a marketing plan for cities the Hopworks team wasn't familiar with, and fighting for shelf space at local stores was hard enough.

The final question on Ettinger's mind was related to another of their top expenses, labor. Since sustainability was always core to Hopworks' ethos, when they were able to hire Director of Sustainability Nate Young in 2012, Ettinger was thrilled. Young completed a full audit of Hopworks' utility costs, measured the impact of new energy-saving equipment, and gave expert advice on the feasibility of new initiatives. He also produced their first-ever sustainability report in 2012, followed by a 2013 report that included their improved impacts (See **Appendices B & C**). But when Ettinger considered his new organizational chart and Hopworks' labor overhead, where did Young fit in now? Young had started as part-time and transitioned to full-time in 2013. However, Hopworks had recently hired a much-needed new Controller, and this role took over some of what Young had been doing.

Did a small craft brewery need a full-time Director of Sustainability, especially if they had already achieved a culture of sustainability, utilized most of their potential investments in sustainability, and fully engaged customers with that mindset? This particular question was difficult, as cutting Young's position directly affected a person key to the Hopworks community, and this in turn could impact morale or give the appearance that their focus on sustainability had waned.

Conclusion

As Ettinger's afternoon meeting drew to a close, he knew that the decisions he was faced with now would shape the future of Hopworks far beyond the scope of their five-year plan. He was certain that Hopworks needed to expand, but it wasn't completely clear how, and what sustainability initiatives might be possible — or what compromises they might have to make. Investing in equipment or software seemed minor compared to the major step of pursuing two new brewpub locations, or moving to distribute their wholesale products more widely. Hopworks was proud to be an organic brewery, but what if they could expand their sustainable impact by including other certifications like Salmon Safe? It came down to a question of their core identity, and how this evolved over time. Could Hopworks balance their ideals with a continued commitment to making the best beer, while staying economically sustainable as well?

Even if the path forward wasn't obvious, Ettinger felt lucky to be in a position where he could make a living brewing beer. He had already grown Hopworks to a company of 125 employees and was deeply committed to expanding the local impact of his business. However Hopworks' five-year plan played out, Ettinger knew that he would succeed in his mission to use the brewery to change the world, one pint at a time.

Exhibits

Exhibit 1: Beer Production

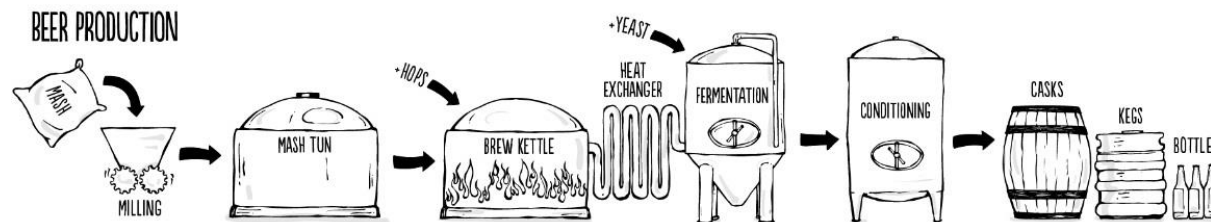


Exhibit 2: Estimated Equipment Costs

<u>Equipment</u>	<u>Estimated Costs with Description</u>
CFL or LED lightbulbs	Estimated Cost Per LED Bulb: \$9.97 - \$99.85 Estimated Cost Per CFL Bulb: \$6.97 - \$29.88 Cost dependent upon variations to design, functionality and wattage 40-100W Dimmable/Non-dimmable
Photovoltaic System (solar panels)	Estimated Cost: \$3.34 per watt or 20 cents per kWh (on a 20-year levelized basis) Estimated costs are an average calculated from the following factors: size of system, system location, system efficiency, solar panel cost, system design, cost of physical installations, permitting and application costs, and many other factors.
Energy Star-certified Water Heater	(a) Estimated Cost: \$2,232 Model: Eternal GU195S Condensing Hybrid Water Heater Up to 19.5 Gallons per Minute (GPM) Ultra low emissions (1ppm CO) Fuel Type: Natural Gas (b) Estimated Cost: \$1,130 Model: Rinnai R98LSeN Tankless Water Heater Up to 9.8 Gallons Per Minute (GPM) Fuel Type: Natural Gas
Glycol Chiller	Installed Cost: \$75,000 Cost includes \$45,000 for unit and \$30,000 for installation Estimate based on a 12,500 bbl/year production
Anaerobic digestors	Installed Cost: \$700,000 - \$1,200,000 Smallest entry level size: 50 kl UASB system Equivalent to a brewery size of between 118,000-236,000 bbl per year production
Aerobic treatment system	Installed Cost: \$400,000 - \$900,000 Smallest entry level: sized to treat 37,854 lpd Equivalent to a brewery size of between 235,000-470,000 bbl per year production

Exhibit 3: Water (gallons) usage per gallon of beer produced 2011 – 2012
(1 Barrel = 31 U.S. Gallons = 1.17 Hectoliter)

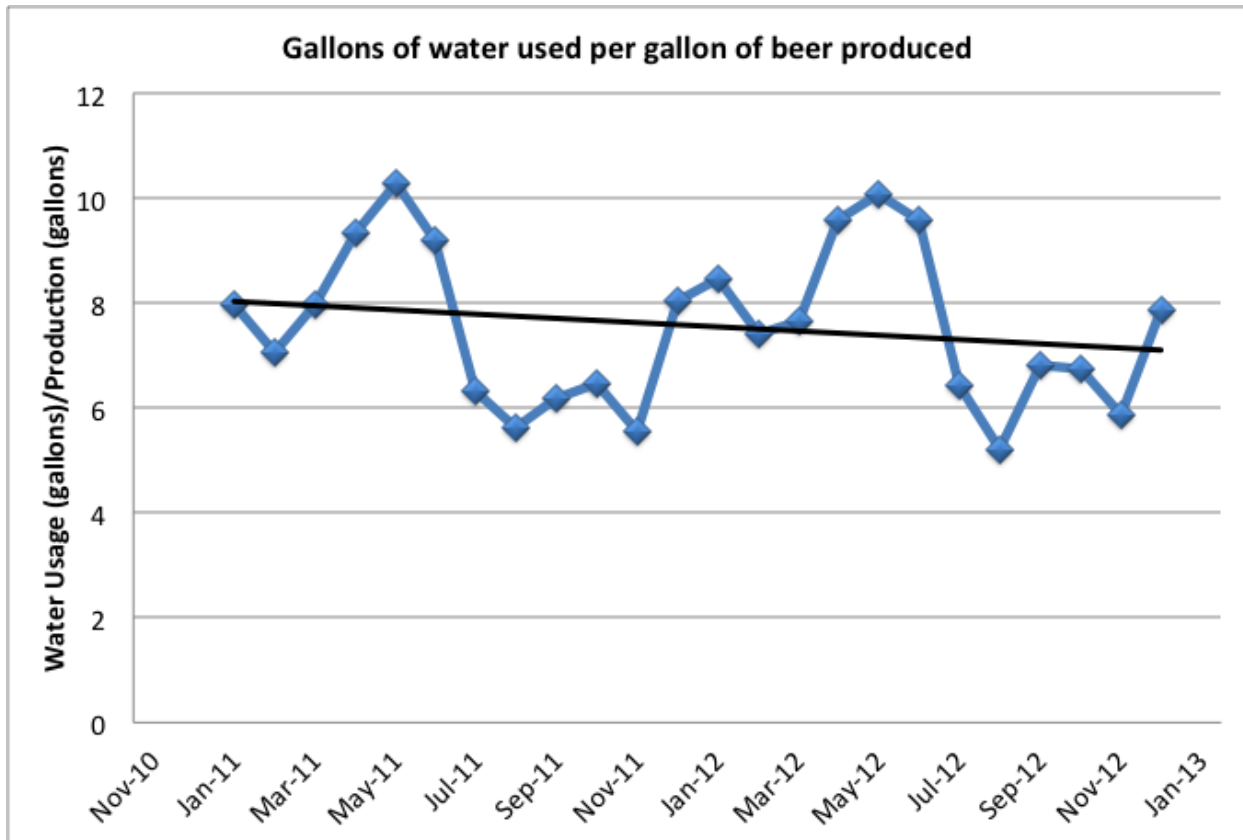


Exhibit 4: Electricity usage (kWh) per barrel of beer produced 2011 – 2012
(1 Barrel = 31 U.S. Gallons = 1.17 Hectoliter)

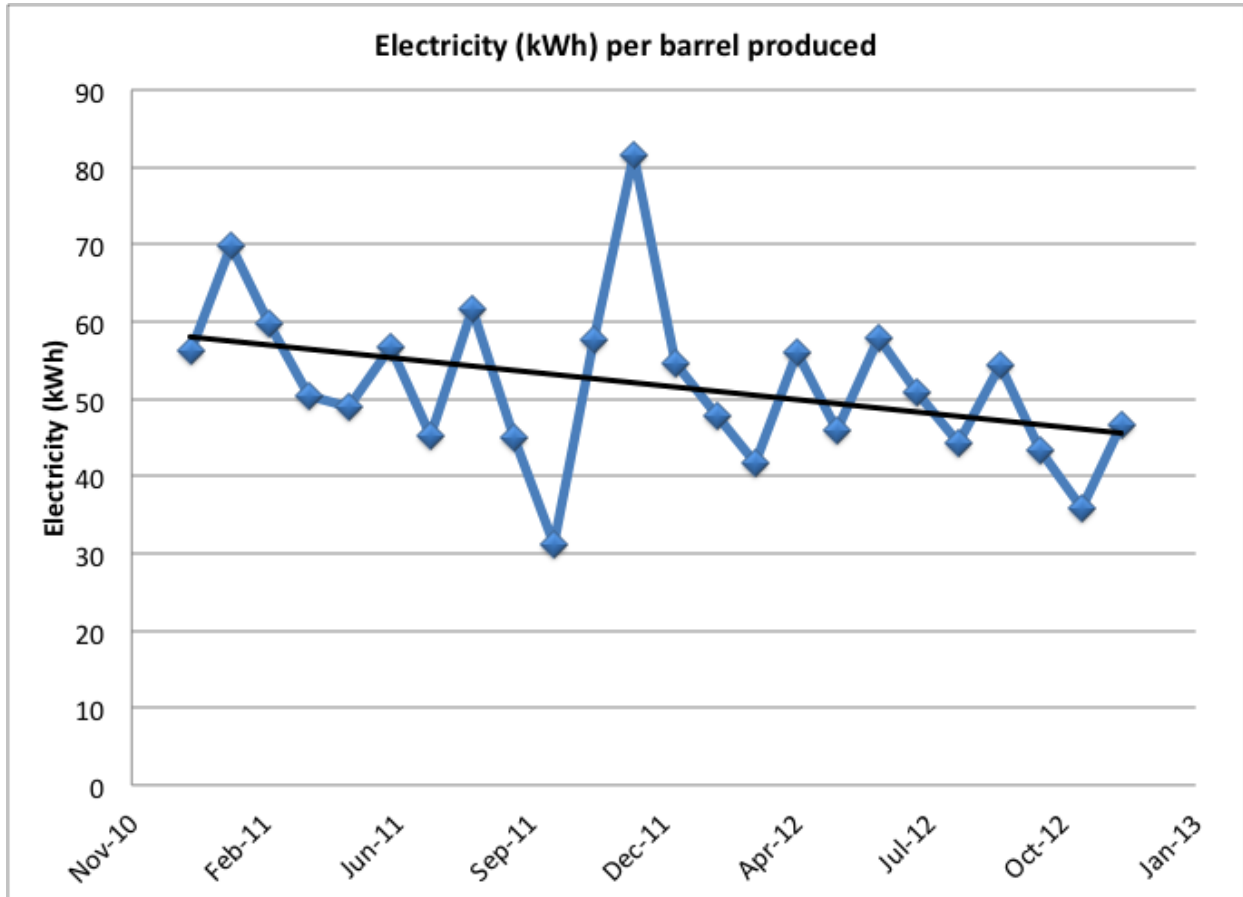
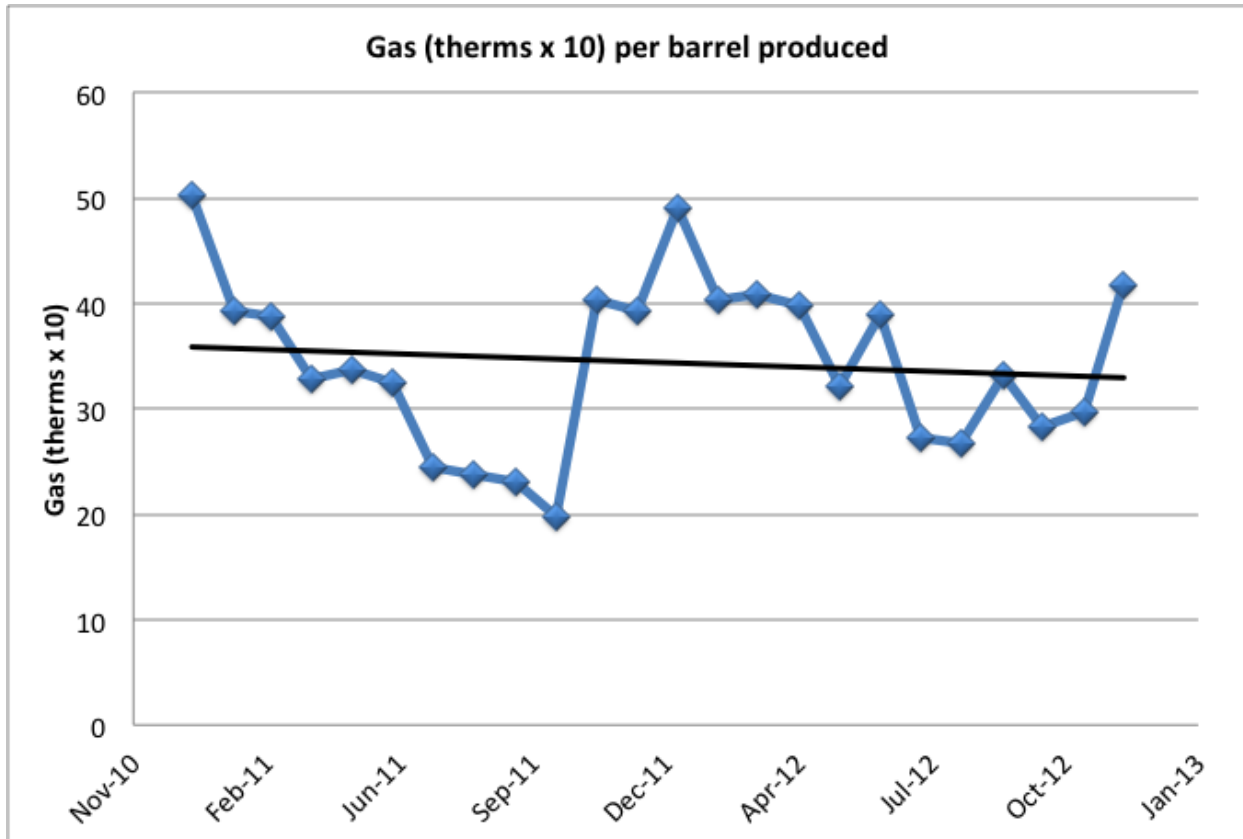


Exhibit 5: Gas usage (therms x 10) per barrel of beer produced 2011 – 2012
(1 Barrel = 31 U.S. Gallons = 1.17 Hectoliter)



Appendices

Appendix A: Hopworks Awards and Certifications

Best 100 Green Places to Work (#37), Oregon Business Journal (2013)

Grand Champion, State of Oregon Sustainability Awards (2012)

Gold Seal, Good Food Awards (2012)

Gold Medal, City of Portland Sustainability at Work (2012)

Gold Status, Travel Oregon Forever (2012)

100 Best Green Places to Work, Oregon Business Magazine (2012)

Bronze Medal for “Organic Hopworks Kellerbier”: Great American Beer Festival - Kellerbier or Zwickelbier category (2012)

Gary Sheppard Memorial Trophy for Best New Exhibitor, Australian International Beer Awards (2011)

Silver Medal for *Hopworks Organic IPA*; Australian International Beer Awards, Ale Packaged – India Pale Ale category (2011)

Silver Medal for *Hopworks Organic Velvet ESB*; Australian International Beer Awards, Ale Packaged – British Style Pale Ale category (2011)

Silver Medal for *Organic Secession CDA*; Australian International Beer Awards, Ale Packaged – Other category (2011)

Bronze Medal for *HUB Organic Lager*; Australian International Beer Awards, Lager Packaged – Pilsner category (2011)

Silver Medal for *Hopworks Organic Velvet ESB*; World Beer Cup, Extra Special Bitter or Strong Bitter category (2010)

Gold Medal for *Organic Ace of Spades Imperial IPA*; Great American Beer Festival, Imperial India Pale Ale category (2009)

Gold Medal for *Organic Rise Up Red*; Great American Beer Festival, American Style Amber/Red Ale category (2009)

Bronze Medal for *Hopworks Organic IPA*; Great American Beer Festival, American-Style Strong Pale Ale category (2008)

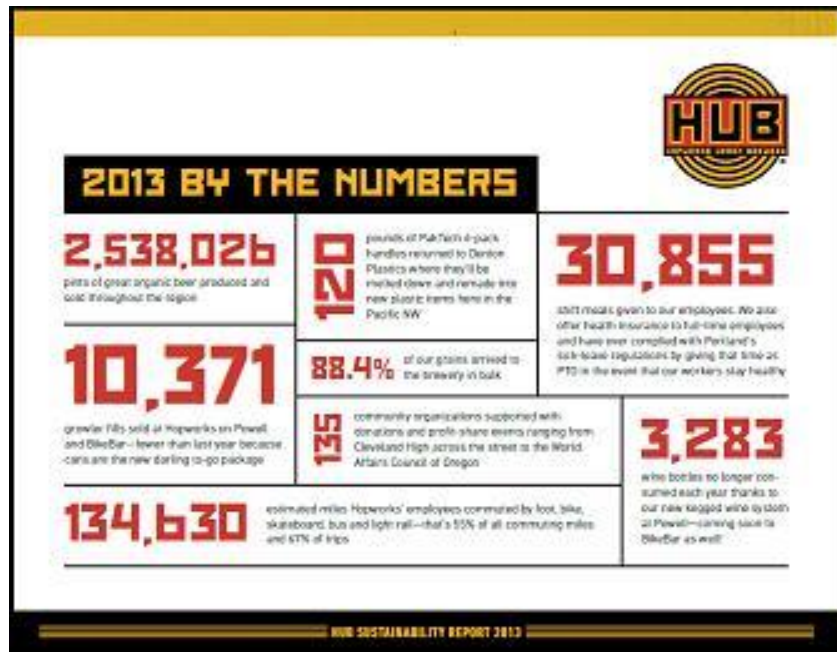
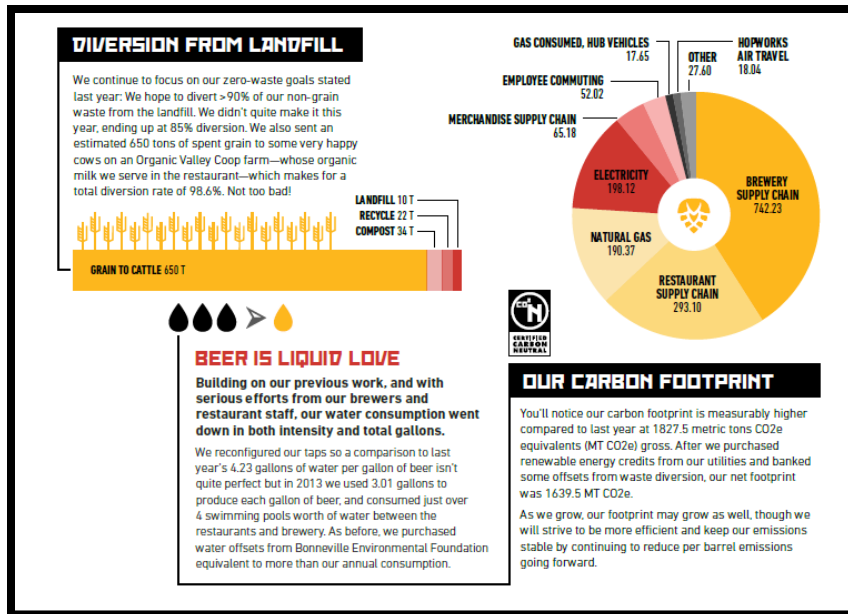
Gold Medal for *Hopworks Organic IPA*; World Beer Cup, American-Style Strong Pale Ale category (2008)

Silver Medal for *HUB Organic Lager*; World Beer Cup, Bohemian-Style Pilsner category (2008)

Certification: Certified Organic by Oregon Tilth

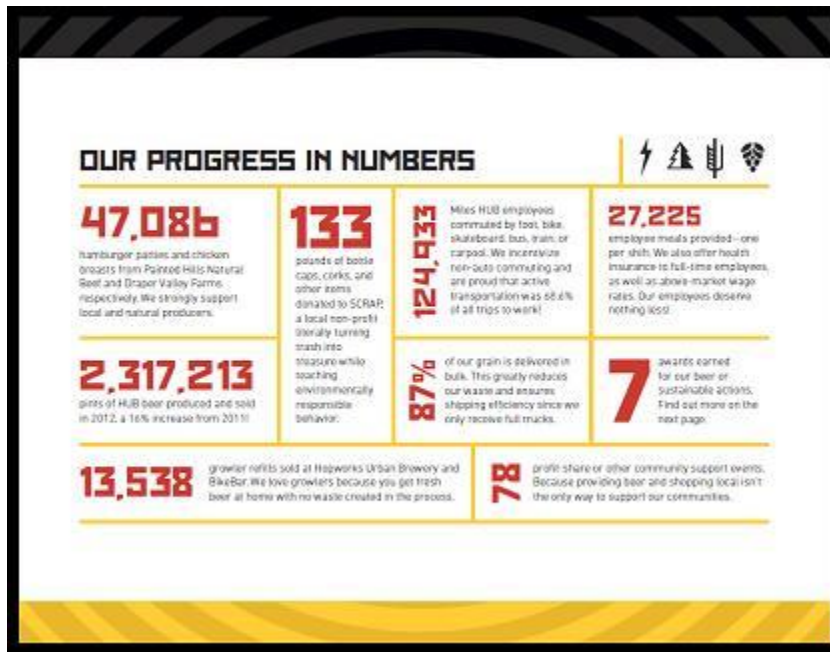
Source: Hopworks.com

Appendix B: Progress in Numbers (2013 Sustainability Report)



Source: Young, Nate. "HUB Sustainability Report 2013." Hopworks.com. 2013. Web. 20 Mar. 2015. <<http://hopworksbeer.com/wp-content/uploads/2014/05/Hopworks-2013-Sustainability-Report.pdf>>

Appendix C: Progress in Numbers (2012 Sustainability Report)

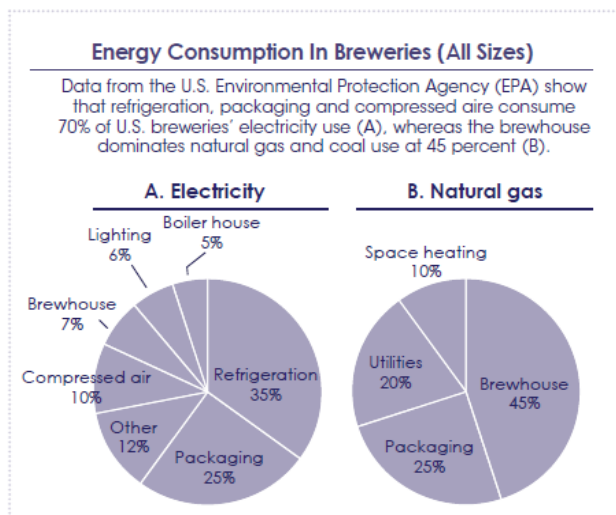


Source: Young, Nate. "2012: Sustainability Report." Hopworks.com. 2013. Web. 20 Mar. 2015. <http://hopworksbeer.com/wp-content/uploads/2013/05/HUB_Sustain2013_LowRes.pdf>

Appendix D: Energy Practices for Breweries

Top 10 Energy Best Practices; Breweries and Brewpubs/Restaurants

ITEM	TOP 10 BREWERY RELATED ENERGY BEST PRACTICES
(1)	Turn off equipment when not in use
(2)	Engage employees on how to conserve and use energy more efficiently
(3)	Replace air filters on air handlers, HVAC units etc. on regular intervals
(4)	Identify and repair compressed air, steam and water leaks
(5)	Repair or Replace damaged or missing insulation
(6)	Eliminate the use of compressed air for cleaning, cooling or other applications
(7)	Review all energy set points on a regular basis
(8)	Upgrade incandescent, T-12 Fluorescent to more efficient lighting types
(9)	Collect steam condensate
(10)	Purchase and install energy efficient equipment



Source: Brewers Association. "Energy Usage, GHG Reduction, Efficiency and Load Management Manual." *Brewers Association*. Antea Group, 2012. Web. 1 Dec. 2014.

Appendix E: U.S. Craft Brewery Competitors

Boston Beer Company

Boston Beer Company, famous for its Sam Adams line of beers, was the 800-pound gorilla in the craft beer market. Topping the charts of the largest craft brewers in the U.S., Boston Beer had twice the production (2.125 million barrels) of the next largest brewer, Sierra Nevada (at just under 1 million barrels per year).^{lviii}

Sierra Nevada

The second largest craft brewer in the U.S. was based in Chico, California. Maintaining a strong focus on sustainability as a key part of operations, Sierra Nevada aimed to contain operating costs. However, this sustainability bent did not make its way into customer-facing marketing.^{lix} For a number of companies, including Sierra Nevada, where their customers might not necessarily care about sustainability, or might not be willing to pay more for sustainability, the company may not be able to use their operating practices as a marketing tool.

New Belgium

Based in Ft. Collins, Colorado, New Belgium rose to prominence on the success of its Fat Tire Amber Ale. An employee owned enterprise and certified B Corporation, New Belgium prominently displayed their sustainability credentials on their website alongside their beer.^{lx} Sustainability at New Belgium covered everything from buying their employees bicycles^{lxi}, in order to encourage them to bike to work, to continuous improvement and constant monitoring of their energy usage. Maintaining transparency in the supply chain so that carbon emissions could be tracked was another feature of their commitment to reducing environmental impact. In order to reduce distribution costs, New Belgium opened a brewery in Asheville, North Carolina to serve the East Coast.^{lxii}

Fort George

Similar in production volume to Hopworks, Fort George Brewery in Astoria, Oregon distributed only in the northwest. Fort George did not bottle any of its beer, selling only in cans and kegs. Canning seven regular beers and six seasonals, Fort George limited the number of beers distributed in cans, keeping the rest of their lineup in kegs. Operating the brewpub in Astoria in the same building as the brewery, Fort George hosted a lecture series every Thursday to draw people to the brewpub and educate people about beer.^{lxiii}

Boneyard Beer

Boneyard Beer in Bend, Oregon was started with used brewing equipment that owner Tony Lawrence collected from 13 different breweries, hence the name “Boneyard.” With a 15,000 barrel production capacity, Boneyard had a similar capacity to Hopworks, but only operated a single tasting room.^{lxiv} At the time of this case, none of Boneyard’s beers were available in bottles or cans.

Bridgeport

Originally founded by Dick and Nora Ponzi in 1984, Bridgeport was purchased by Gambrinus, the makers of Shiner Beer in San Antonio Texas.^{lxv} Bridgeport is Oregon’s oldest microbrewery.^{lxvi} Operating brewpubs around Portland as well as distributing bottles across a wide geographic region, Bridgeport maintained its status among the old guard of United States craft brewers.

References

- ¹ Oregon Craft Beer. "Economic Impact." *Oregon Craft Beer*. Oregon Brewers Guild, 2013. Web. 1 Dec. 2014. <<http://oregoncraftbeer.org/oregon-beer/economic-impact/>>
- ² The information in this section came from the following sources: Ettinger, Christian. Personal Interview. 11 Nov. 2014; Young, Nate. "2013 Sustainability Report." *Hopworks Urban Brewery*. Hopworks Urban Brewery, 2014. Web. 1 Dec. 2014.
- ³ Ibid.
- ⁴ Bell, John. "Christian Ettinger Revolutionizes Craft Brew Scene ... Again." *Drive the District*. General Motors, 5 May 2014. Web. 1 Dec. 2014. <<http://www.drivethedistrict.com/2014/05/05/christian-ettinger-revolutionizes-craft-brew-scene-again/>>
- ⁵ "Economic Impact."
- ⁶ Ettinger, Christian. Personal Interview. 11 Nov. 2014.
- ⁷ "Christian Ettinger Revolutionizes Craft Brew Scene ... Again."
- ⁸ The information in this paragraph came from the source: "Building Green." *Hopworks*. Hopworks Urban Brewery, 2008. Web. 1 Dec. 2014. <<http://hopworksbeer.com/green-culture/building-green>>
- ⁹ "100 Best Green Companies to Work For in Oregon 2013." *Oregon Business*. Oregon Business, 27 May 2013. Web. 5 Dec. 2014. <<http://www.oregonbusiness.com/articles/131-june-2013/10210-100-best-green-companies-to-work-for-in-oregon-2013>>
- ¹⁰ Young, Nate. "2013 Sustainability Report." *Hopworks Urban Brewery*. Hopworks Urban Brewery, 2014. Web. 1 Dec. 2014.
- ¹¹ Willis, Warren. "At Hopworks Urban Brewery, Christian Ettinger's Strategy for Success Revolves Around Sustainability." *The Latest Just About Everything We Think Matters*. American Craft Beer, 14 Aug. 2013. Web. 1 Dec. 2014. <<http://americancraftbeer.com/item/at-hopworks-urban-brewery-christian-ettinger-s-strategy-for-success-revolves-around-sustainability.html>>
- ¹² "Craft Beer." *Encyclopedia of Emerging Industries* (2000): n. pag. *Business Insights: Global*. Web.
- ¹³ "About Mayflower Brewing Company." *Mayflower Brewing Company - Craft Beer Microbrewery*, 2014. Web. 1 Dec. 2014. <<http://mayflowerbrewing.com/about.php>>
- ¹⁴ "Craft Beer."
- ¹⁵ Ibid.
- ¹⁶ Ibid.
- ¹⁷ Glass, Gary. "Statutes." *American Homebrewer's Association*. Brewer's Association, 2014. Web. 20 Nov. 2014. <<http://www.homebrewersassociation.org/homebrewing-rights/statutes/>>
- ¹⁸ Brown, Davis. "MetaCraft Cultural Drive Behind Craft Brewing." *MetaCraft*. MetaCraft, Inc., 2 Sept. 2014. Web. 20 Nov. 2014. <<http://www.metacraftcorp.com/?p=471>>
- ¹⁹ Van Wieren, Dale P. *American breweries II*. 2nd ed. North Wales: Eastern Coast Breweriana Association, 1995. Print.
- ²⁰ Woodward, Bob, and Laurel Bennett. "Oregon Beer History." *1859 Oregon Magazine*. 1859 Oregon Magazine, 1 Jan. 2010. Web. 1 Dec. 2014. <<http://1859oregonmagazine.com/oregon-beer-history>>
- ²¹ "Economic Impact."
- ²² Pullman, Mellie. "Green Brewing Part Two." *BEERnorthwest* 2010: 56-60. Print.
- ²³ Petrillo, Nick. "Craft Beer Production - Products and Markets." *IBISWorld US*. IBISWorld, Sept. 2014. Web. 1 Dec. 2014.
- ²⁴ Young, Nate. Personal Interview. 6 Oct. 2014.
- ²⁵ "Craft Beer Production - Products and Markets."
- ²⁶ Ibid.
- ²⁷ Mickle, Tripp. "Budweiser Crowded Out by Craft Beer Craze." *WSJ*. Wall Street Journal, 23 Nov. 2014. Web. 1 Dec. 2014. <<http://www.wsj.com/articles/budweiser-ditches-the-clydesdales-for-jay-z-1416784086>>

²⁸ Ibid.

²⁹ Jones, Lester. "Brewery Permits Top 4,500 for First Six Months of 2014." *NBWA*. America's Beer Distributors, July 2014. Web. 5 Dec. 2014. <<http://www.nbwa.org/resources/brewery-permits-top-4500-first-six-months-2014>>

³⁰ "Craft Beer Production - Products and Markets."

³¹ Ibid.

³² Walker, Mason. "Bend's 10 Barrel Brewing bought by world's largest beer company." *Portland Business Journal*. American City Business Journal, 5 Nov. 2014. Web. 1 Dec. 2014. <<http://www.bizjournals.com/portland/blog/2014/11/bends-10-barrel-brewing-bought-by-worlds-largest.html>>

³³ Tuttle, Brad. "That Craft Beer You're Drinking Isn't Craft Beer. Do You Care?" *TIME.com*. Time Magazine, 13 Aug. 2013. Web. 1 Dec. 2014. <<http://business.time.com/2013/08/13/that-craft-beer-youre-drinking-isnt-craft-beer-do-you-care/>>

³⁴ Ibid.

³⁵ Young, Nate. Personal Interview. 6 Oct. 2014.

³⁶ Weaver, Ken. "Distributors in the Three Tier System." *All About Beer*. All About Beer Magazine, 1 Nov. 2012. Web. 2 Dec. 2014. <<http://allaboutbeer.com/article/craft-beer-distributors/>>

³⁷ Badger, Emily. "Asheville: The New Craft Beer Capital Of America?" *Fast Company*. Fast Company, 5 Sept. 2012. Web. 1 Dec. 2014. <<http://www.fastcompany.com/3000850/asheville-new-craft-beer-capital-america>>

³⁸ "Craft Beer Production - Products and Markets."

³⁹ Mintel. "Marketing to the Green Consumer." *Mintel Group*. Mintel.com, 2014. Web. 16 Mar. 2015.

⁴⁰ Brewers Association. "Energy Usage, GHG Reduction, Efficiency and Load Management Manual." *Brewers Association*. Antea Group, 2012. Web. 1 Dec. 2014. <https://www.brewersassociation.org/attachments/0001/1530/Sustainability_Energy_Manual.pdf>

⁴¹ Brewers Association. "Water and Wastewater: Treatment/Volume Reduction Manual." *Brewers Association*. Antea Group, 2013. Web. 1 Dec. 2014. <https://www.brewersassociation.org/attachments/0001/1517/Sustainability_-_Water_Wastewater.pdf>

⁴² Pullman, Mellie. "Green Brewing Part Two." *BEERnorthwest* 2010: 56-60. Print.

⁴³ Pullman, Mellie. "Green Brewing Part One." *BEERnorthwest* 2009: 56-60. Print.

⁴⁴ Ibid.

⁴⁵ Brewers Association. "Solid Waste Reduction Manual." *Brewers Association*. Antea Group, 2012. Web. 1 Dec. 2014. <http://www.brewersassociation.org/attachments/0001/1529/Sustainability_Manual_Solid_waste.pdf>

⁴⁶ Ibid.

⁴⁷ The information in this section came from the source: Young, Nate. Personal Interview. 6 Oct. 2014.

⁴⁸ PSU's Center for Executive and Professional Education. "Interview with Christian Ettinger at Hopworks Urban Brewing on Sustainability." *YouTube*. YouTube, 27 Oct. 2013. Web. 26 July 2014. <<http://youtu.be/kNuPsN-PK8I>>

⁴⁹ "Interview with Christian Ettinger at Hopworks Urban Brewing on Sustainability."

⁵⁰ The information in this section came from the source: "2013 Sustainability Report."

⁵¹ "Building Green."

⁵² "About : Salmon-Safe." *Salmon Safe*. Salmon Safe, n.d. Web. 1 Dec. 2014.

⁵³ Ettinger, Christian. Personal Interview. 11 Nov. 2014.

⁵⁴ Young, Nate. Personal Interview. 6 Oct. 2014.

⁵⁵ Shanker, Deena. "Organic Beer: Here to Stay, or Barley There?" *Grist*. Grist, 28 May 2013. Web. 05 Dec. 2014. <<http://grist.org/food/organic-beer-here-to-stay-or-barley-there/>>

⁵⁶ Ibid.

⁵⁷ Anderson, Jennifer. "Farmers Go Out On Limb to Grow Organic Hops." *Portland Tribune*. Pamplin Media Group, 11 Sept. 2014. Web. 5 Dec. 2014. <<http://pamplinmedia.com/sl/233297-97889-farmers-go-out-on-limb-to-grow-organic-hops>>

^{lviii} "Top Craft Beer Makers, 2012." *New York Times* 1 Oct 2013: B6. Print.

^{lix} "Sustainability." *Sierra Nevada*. Sierra Nevada Brewing Co., n.d. Web. 1 Dec. 2014.
<<http://www.sierranevada.com/brewery/about-us/sustainability>>

^{lx} "Sustainability Stories." *New Belgium Brewing*. New Belgium Brewing, 2014. Web. 1 Dec. 2014.
<<http://www.newbelgium.com/Sustainability/Stories.aspx>>

^{lxi} "Benefits." *New Belgium Brewing*. New Belgium Brewing, 2013. Web. 1 Dec. 2014.
<<http://www.newbelgium.com/Brewery/company/benefits.aspx>>

^{lxii} "Asheville: The New Craft Beer Capital Of America?"

^{lxiii} *Fort George Brewery and Public House*. Fort George Brewery, n.d. Web. 28 Nov. 2014.
<<http://www.fortgeorgebrewery.com>>

^{lxiv} "About." *Boneyard Beer*. Boneyard Beer, n.d. Web. 28 Nov. 2014. <<http://boneyardbeer.com/about/>>

^{lxv} Foyston, John. "A BridgePort Timeline." *OregonLive.com*. The Oregonian, 11 Aug. 2009. Web. 1 Dec. 2014.
<http://blog.oregonlive.com/thebeerhere/2009/08/a_bridgeport_timeline.html>

^{lxvi} Jones, A. "Craft Brewing Defines Oregon as U.S. "Beer Capital"." *National Geographic News*. National Geographic, 10 Aug. 2001. Web. 1 Dec. 2014.
<http://news.nationalgeographic.com/news/2001/08/0808_oregonbrewing_2.html>