

Water Use & Craft Beer

Minimizing Impacts

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Agenda

- Brewery Vivant
- The Industry
- Water & Beer
- Collective Efforts
- What's Next?
- How You Can Help



Brewery Vivant

- Belgian and French inspired brewery & pub
- Located in the East Hills neighborhood of Grand Rapids
- Distribute in 16oz cans & kegs to Michigan and Chicago
- Not haunted by ghosts as far as we know...



Brewery Vivant



- 1st LEED certified commercial microbrewery in the world, 2012
- Certified B Corporation, 2014
- WMSBF Sustainable Business of the Year, 2015

Unavoidable B Corporation Advertisement

- A higher standard of social & environmental performance, transparency, and accountability
- Evaluates the entire company rather than just one aspect
- Helps distinguish between good companies and good marketing
- Legally required to consider the impact of our decisions on our stakeholders
- Bi-annual recertification and on-site audit
- A tool to continuously evaluate progress and areas for improvement
- Over 1600 B's worldwide

What makes us a better company?

B Impact Report

Certified since: May 2014

Summary:	Company Score	Median Score*
Governance	9	10
Workers	20	22
Community	18	32
Environment	39	9
Overall B Score	86	80

80 out of 200 is eligible for certification

*Of all businesses that have completed the **B Impact Assessment**

†Median scores will not add up to overall



Craft Beer Industry

Information from the Brewers Association

Craft Brewery Definitions

- Annual production of 6 million barrels of beer or less
 - Regional brewery – produces 15,000-6MM bbls
 - Microbrewery – less than 15,000 bbls/yr, 75% or more sold offsite
 - Brewpub – restaurant/brewery that sells 25% or more onsite
 - Contract – hires another brewery to produce the beer
- Less than 25% of the brewery is owned or controlled by an alcoholic beverage industry member that is not itself a craft brewer
- Over 4000 craft breweries today nationally, growing ~20% each year

U.S. BEER SALES VOLUME GROWTH 2014

**OVERALL
BEER**
0.5%

197,124,407 bbls

17.6%
CRAFT

21,775,905 bbls

**IMPORT
BEER**
6.9%

29,430,185 bbls

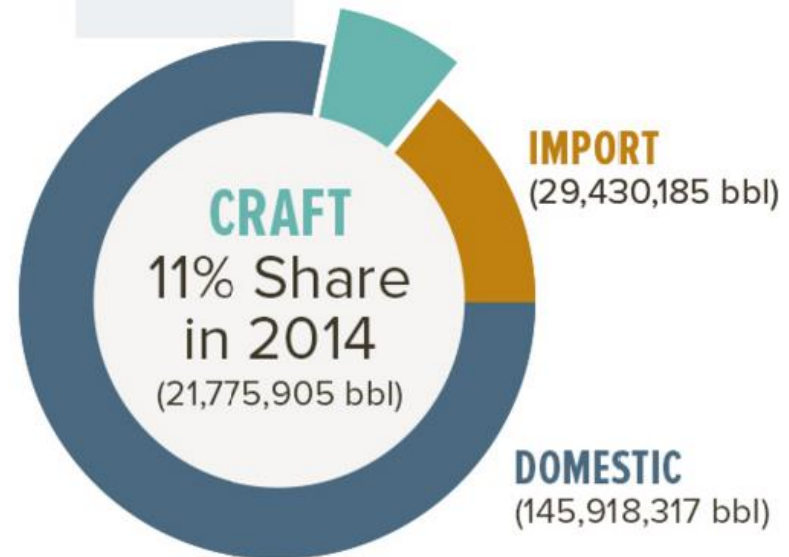
36%
**EXPORT
CRAFT
BEER**

383,422 bbls

OVERALL BEER MARKET
\$101.5 BILLION

CRAFT BEER MARKET
\$19.6 BILLION

22% DOLLAR SALES GROWTH



196 Craft Breweries in MI Today



2.2 Breweries per Capita*
(RANKS 14TH)
*per 100,000 21+ Adults

\$
ECONOMIC IMPACT

1,852
Million Economic Impact
(RANKS 9TH)

260.03
Impact per Capita
(RANKS 20TH)


PRODUCTION

825,103
Barrels of Craft beer
produced per year
(RANKS 10TH)

3.6
Gallons per 21+ Adult
(RANKS 13TH)

NUMBER OF BREWERIES PER YEAR





BIER Water Use Data

Beverage Industry Environmental Roundtable

BIER Water Ratio Study

Table 1. 2014 Benchmarking Study Performance Summary¹

	2009	2010	2011	2012	2013
Total Companies Reporting	17	18	18	18	18
Total Facility Count	1,582	1,693	1,691	1,719	1,723
Total Production (bil L)	260	287	292	304	308
Total Water Use (bil L)	796	883	812	824	812
Total Energy Use (bil M J)	184	193	202	218	214
Water Use Ratio (WUR) (L/L)	3.06	2.91	2.78	2.71	2.64
<i>Brewery (Beer Only)</i>	4.48	4.23	3.98	3.84	3.65
<i>Distillery</i>	37.94	34.99	35.31	33.85	37.80
<i>Winery</i>	3.79	4.11	4.74	3.59	4.09
<i>Bottling (All)</i>	2.19	2.10	2.02	1.99	1.95
Energy Use Ratio (EUR) (MJ/L)	0.80	0.78	0.69	0.72	0.71
<i>Brewery (Beer Only)</i>	1.25	1.22	1.17	1.25	1.23
<i>Distillery</i>	12.58	11.99	12.07	11.94	12.59
<i>Winery</i>	1.37	1.87	2.04	1.47	1.67
<i>Bottling (All)</i>	0.47	0.46	0.41	0.41	0.40

2011 Benchmarking Study

- Water use ratios are impacted by:
 - The type and size of packaging used
 - The size of the facility
- Reducing water use reduces effluent load. Focusing on water conservation will positively affect both water and wastewater reduction in the brewery.



Craft Brewery Data

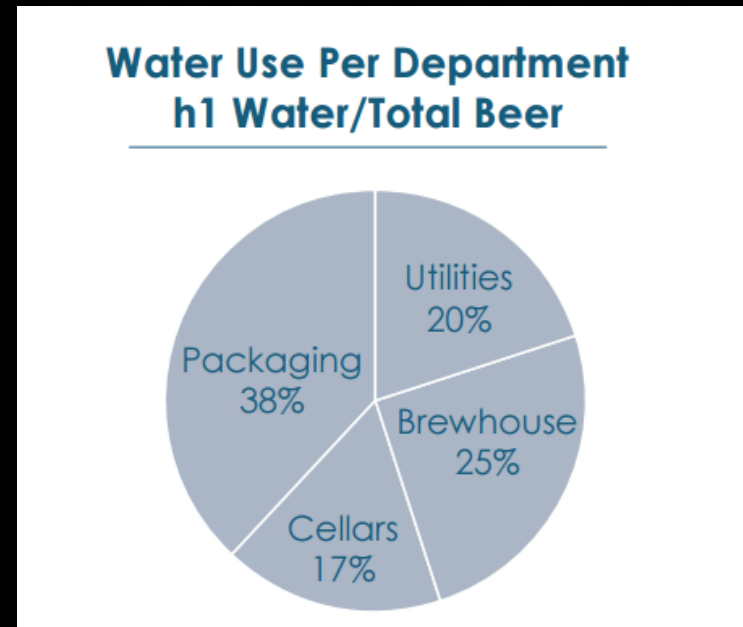
Information from the Brewers Association

Water & Craft Beer

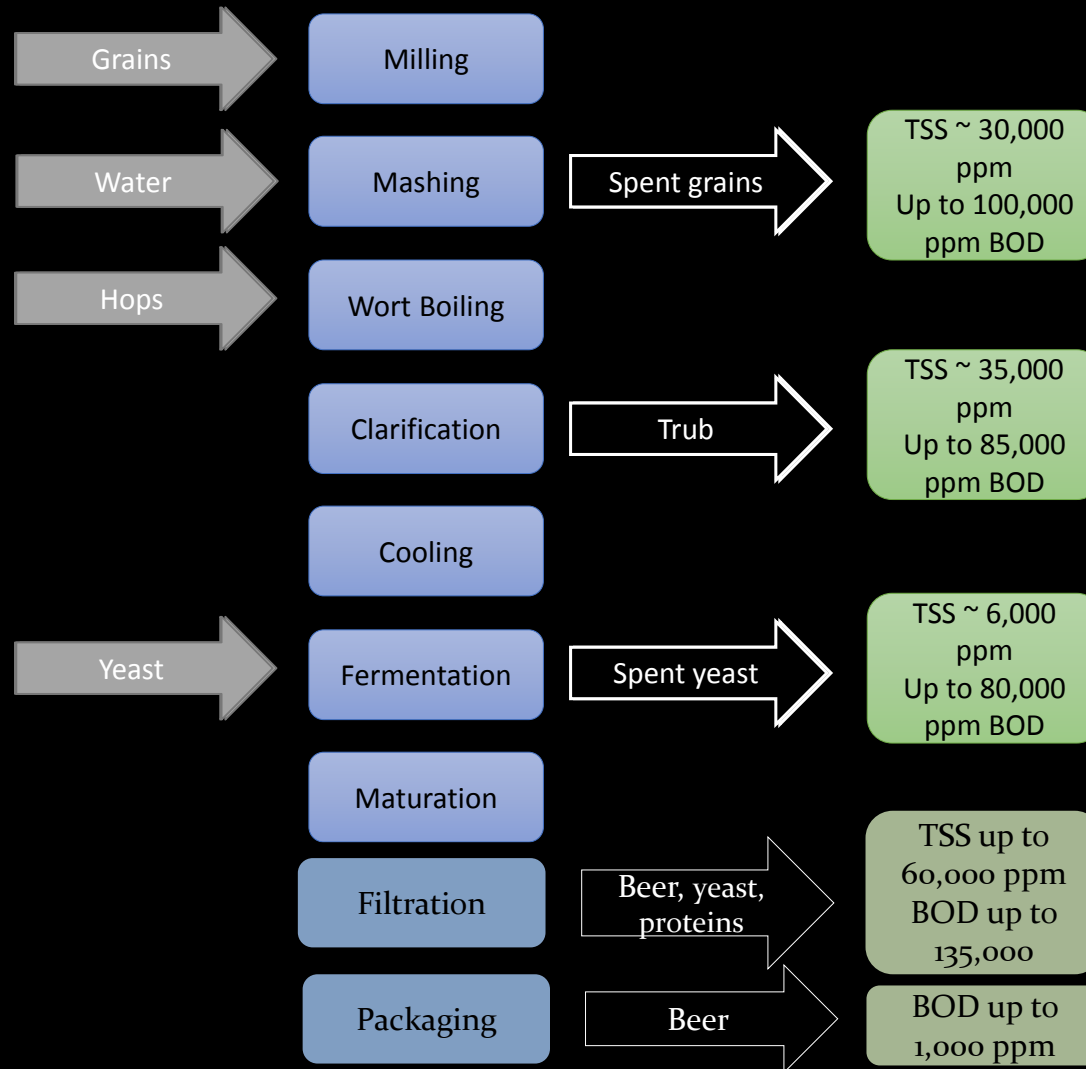
- Water to beer ratio
 - Best practice 3:1
 - Large craft breweries 5-7:1
 - Small craft breweries 8-10:1
- Most breweries discharge 70% of their incoming water as effluent
- In many communities, breweries may be the largest consumer of water and the largest source of organic effluent that must be treated by the municipal treatment plant
- Municipalities are targeting breweries, measuring their effluent and often adding on surcharges for treating it

Water & Craft Beer

- There are four main areas where water is used.
- Ancillary operations such as food service also contribute to water usage.



The Brewing Process & Impacts



*Water is used all along this path to clean and sanitize equipment

Senseless Water Use

FAULT	ESTIMATED POTENTIAL COSTS (U.S.\$/HOUR)
Hose left on	14.00
Bottle pasteurizer rinse jets left switched on	14.00
Bottle rinser left switched on	6.10
Leaking float valve on the cooling tower	4.10
Leaking ball valve on the bottle pasteurizer	2.00
Leaking ball valve in the keg plant	1.90
Pasteurizer header tank top-up valve jammed	1.65

Leak Water Loss Guide (Water Loss in Gallons at 50 PSI)

Leak this Size	Loss per Day	Loss per Month	Loss per Year
	120	3,600	43,200
	360	10,800	129,600
	693	20,790	249,480
	1,200	36,000	432,000
	1,920	57,600	691,200
	3,096	92,880	1,114,560
	4,296	128,880	1,546,560
	6,640	199,200	2,390,400
	6,984	290,520	2,514,240

Reduction Techniques

- Training & process changes
- Equipment adjustments
 - Flow meters, adjustment
 - Automatic shut-off controls
- Reuse wastewater
 - Heat exchanger
 - Rinse water
- Filtration methods



Beer Impacts

- BOD biochemical oxygen demand:
 - The amount of dissolved oxygen (DO) needed by aerobic biological organisms to break down organic material.
 - The more organic material available to eat, the more oxygen needed by the microbes.
 - The high organic nature of brewery wastewater causes oxygen in a surface water to be depleted at a rapid rate which negatively impacts living species and biodiversity.
- TSS total suspended solids
 - Solid materials, including organic and inorganic, that are suspended in the water
 - Can cause turbidity in aquatic ecosystems, which blocks UV penetration and can clog filter-feeding organisms.

Beer Impacts

- pH
 - The brewing process as well as the chemicals used to clean the brewing equipment can cause wide swings in the pH of brewery effluent
 - pH can range from 2-12 depending on the stage in the brewing processes as well as the amount and kind of cleaning agents used
- Additionally, nitrogen and phosphorus could be a potential wastewater concern for breweries due to the types of cleaning chemicals used

Effluent Impacts

- Effluent from individual process steps is variable.
 - For example, washing bottles produces a large volume of effluent that contains only a minor amount of the discharged organics from the brewery.
- Effluent from fermentation and filtering are high in BOD and low in volume, accounting for about 3% of total wastewater volume but 97% of BOD.

2014 BA Wastewater Survey

- Most craft breweries discharge their effluent to a municipal treatment center.
- About half did not have any pre-treatment installed at their facility to treat the effluent prior to the municipal discharge.
- Those who had some pretreatment mainly adjusted the pH and settled and removed the solids.
- Wastewater costs are mainly determined based on the incoming water purchased and estimated strength of effluent rather than the real flow of effluent discharged based on metering.
- Approximately one third paid an extra surcharge based on the effluent strength (BOD and TSS).

Treatment Methods

- Treatment options include physical, chemical, and biological methods.
- Physical
 - Screening and side-streaming are most common and are highly effective at reducing TSS and BOD
 - Cattle feed
 - Fertilizer
 - Compost
 - Renewable energy
 - Holding tanks are beneficial for timing releases as well as neutralizing pH.



Treatment Methods

- Chemical treatment
 - Used primarily to adjust the pH of wastewater before it is sent to the sewer. The addition of CO₂ or acids can decrease the pH of alkaline wastewaters.
 - Coagulates and flocculants can be added to help separate out organic matter and suspended solids
- Biological treatment
 - The most costly form of treatment
 - Utilizes microbes to consume the organic matter in the wastewater, producing a combination of gases and settleable solids and reducing BOD
 - Constructed wetlands are a very simple and inexpensive ecological treatment system that can be used to clean wastewater

Wastewater Treatment

Typical Ranges Of Brewery Untreated “End-Of-Pipe” Wastewater Effluent

PARAMETER	TYPICAL RANGE
Water to beer ratio	4 - 10 liter/liter
Wastewater to beer ratio	1.3 - 2 liter/liter lower than water to beer ratio
Biochemical Oxygen Demand (BOD)	600 - 5,000 ppm
Chemical Oxygen Demand (COD)	1,800 - 5,500 ppm
Nitrogen	30 - 100 ppm
Phosphorus	30 - 100 ppm
pH	3 - 12
Total Suspended Solids (TSS)	200 - 1,500 ppm

Typical Ranges Of Brewery Pre-Treated “End-Of-Pipe” Wastewater Effluent

PARAMETER	TYPICAL RANGES
BOD	100 - 400 ppm
pH	6-9
TSS	50-500 ppm

Collective Efforts

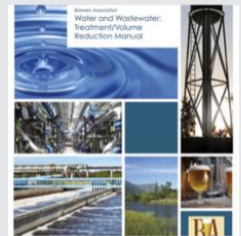
- MBG Sustainability Subcommittee
- Brewers Association manuals
 - Water and wastewater
 - Wastewater addendum
- Brewers for Clean Water NRDC campaign
 - Created by Natural Resources Defense Council (NRDC)
 - Lobbying to support updates to the Clean Water Act
 - 50+ breweries involved

SUSTAINABILITY MANUALS

Water & Wastewater Sustainability Manual

March 17, 2014

Water and Wastewater: Treatment/Volume Reduction Manual Craft brewers are innovative leaders in the beverage sector and take pride in developing new products and processes that give both brewery employees and customers options for sustainable living. Despite ...**MORE**



Solid Waste Sustainability Manual

March 17, 2014

Solid Waste Reduction Manual Craft brewers are an innovative segment of the greater brewing industry. Subsequently, it is no surprise that many craft brewers have found innovative solutions for waste management. These solutions reach beyond a...**MORE**



Energy Sustainability Manual

March 17, 2014

Energy Usage, GHG Reduction, Efficiency and Load Management Manual Craft brewers are an innovative segment of the greater brewing industry. It's no surprise that many craft brewers have discovered creative solutions for energy usage and greenhouse gas...**MORE**



What's Next?

- More regulation
- More innovation
- Water credits



How You Can Help

- Talk to your favorite brewery about water
- Tell entrepreneurs to check out our industry
- Vote with your dollars. Expect more from all of the businesses you support. Tell them about B Corps.
- Drink local beer!

