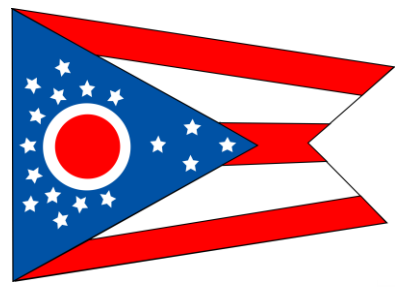


Adaptive Brewing Program



Jon M Newton
4 Barking Dogs Brewery & Tap House
24 Aug 2024



Overview

- Introduction
- History of Brewing
- Ingredients
- Equipment
- Adaptive Brewer
- Summary
- Questions



Introduction

- US Army Military Intelligence Corps, 21-years, 1SG
- Three continents
- Brewing 40 years
- Instructor, beer enthusiast, community builder
- NWPVA presentation, Associate Member
- No presence in brewing community
- Desire-Need-Solution
- Adaptive Brewing Evangelist



History of Brewing

- Homebrewing's roots can be traced back to ancient civilizations that were developing and tasting recipes for ales and wine. As early as 7,000 BCE, homebrewing was a normal part of household tasks often assigned to women
- The oldest brewery in the world was unearthed at an old cemetery site by American and Egyptian archeologists in Feb 2021, in Abydos, Egypt. The brewery is believed to be more than 5,000 years old and to have an impressive production capacity of up to 5,900 gallons at a time. This brewery goes back to King Narmer's era, around 3,150 BC
- *In wine there is truth, in beer there is Freedom, in water there is bacteria* - Benjamin Franklin
- Virginia Colony forgot to include a brewer in their initial settlement and had to send back to England for a brewer.
- In landing at Plymouth on Cape Cod in December of 1620 instead of along the Hudson River as planned, and purportedly because of dwindling beer supplies, William Bradford's words have become legendary: *"For we could not now take time for further search or consideration, our victuals being much spent, especially our beer ..."*





What's in Beer?

- Malt
- Hops
- Yeast & Bacteria
- Water





Malt

Malt is the principal source for fermentable sugar in beer. Raw, brewing-grade barley undergoes a germination and kilning process by malt manufacturers to prepare it for brewers. In other words, malt is barley that has been sprouted and dried.

Every combination of roasting time, temperature, pH, concentration, sugar, and nitrogenous compounds will create a different set of flavor chemicals in a malt. Base malt refers to the majority of the malted grains used to make beer while specialty malts (e.g. chocolate malt) have a more dramatic impact on the flavor, mouthfeel, and color of the beer. Utilizing specialty malts is a relatively easy way to add more depth and character to extract brews.



Agricultural historians believe that the barley grown across Europe in the early Middle Ages was mainly six-row. The genetic ancestors of two-row types grown in Europe were likely brought back from the Middle East during the Crusades.

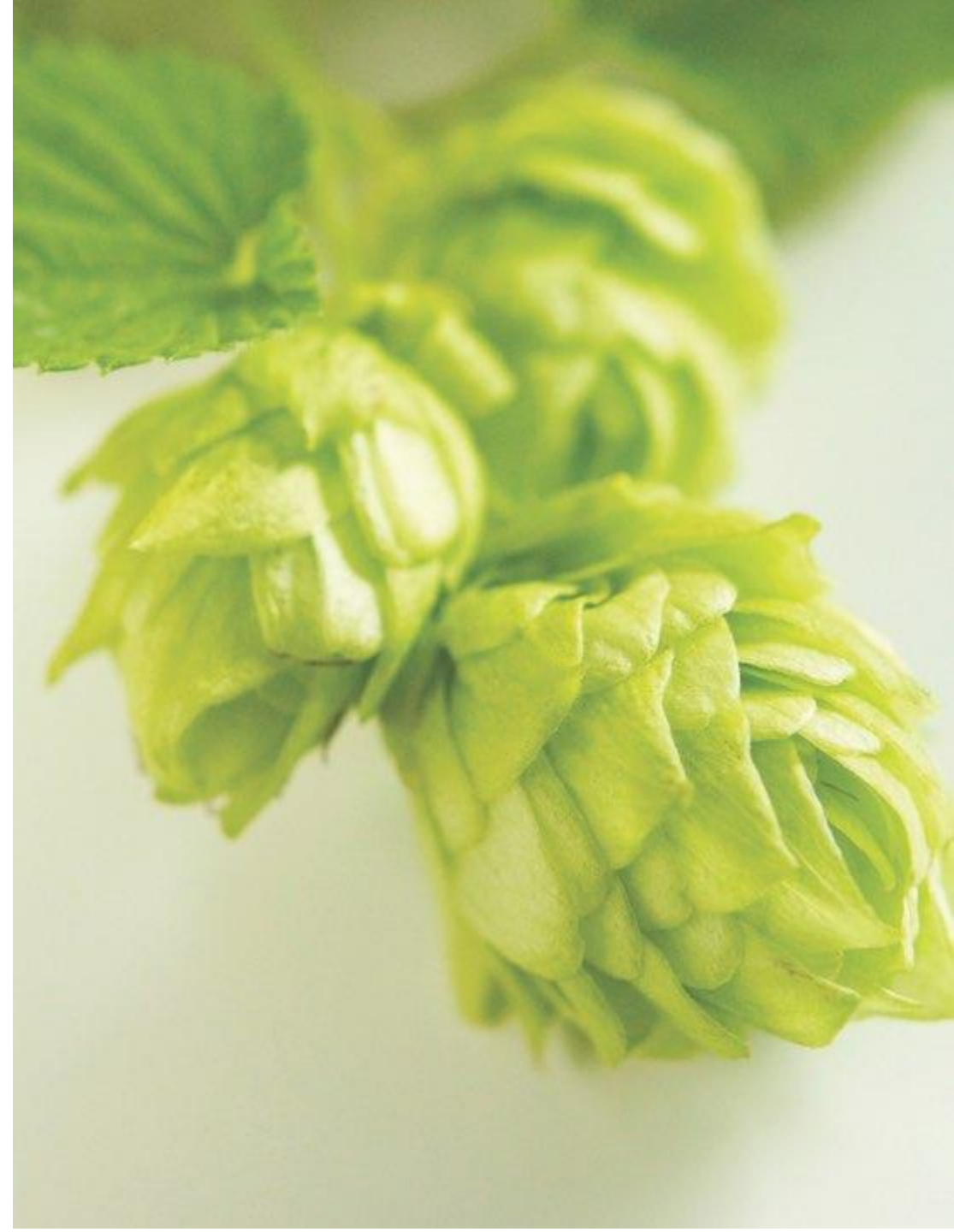




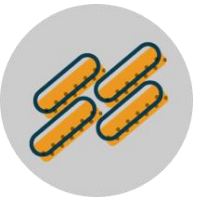
Hops

More than just resembling rabbit food in pellet form, hops are the green, cone-shaped flower of the hop plant that are used to add balance, flavor, and aroma to beer. Hops contain specific amounts of alpha and beta acids, as well as essential oils broken down in boiling wort that give many beers their signature bitterness, flavor, and aroma.

You may also use a technique called dry hopping, in which hops are added after fermentation for added aroma and flavor. Aside from the added flavors hops lend, they are also an excellent preservative of beer.



The genus *Humulus* likely originated in Mongolia at least six million years ago. A European type diverged from that Asian group more than one million years ago; a North American group migrated from the Asian continent approximately 500,000 years later.



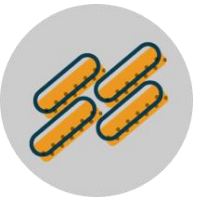
Yeast & Bacteria

Brewer's yeast (*Saccharomyces*) is a type of fungus that consumes fermentable sugars in the wort and creates alcohol and carbon dioxide as a byproduct, a process known as fermentation. The nuances of fermentation come down to the type of yeast used, primarily ale or lager yeast.

Using two different types of yeast in the same wort can create drastically different beers. Other than alcohol and carbon dioxide, yeast strains produce other compounds like esters, fusel alcohols, ketones, and various phenols and fatty acids, all of which contribute to the character of a beer.



A single yeast cell is about 5 to 10 microns (0.0002–0.0004 inches) in size and round to ovoid in shape. And although a yeast cell is ten times larger than bacteria, it is still too small to be seen by the naked eye. In fact, it takes more than ten yeast cells to equal the diameter of one human hair.



Yeast & Bacteria

Wild yeast and bacteria like *Brettanomyces* (Brett), *Lactobacillus* (Lacto), or *Pediococcus* (Pedio), are either very favorable or avidly detested by brewers due to their reputation as contaminants. While these yeasts and bacteria can pose a high risk for cross-contamination, the unique flavor and aromas they produce can outweigh the risk and extra effort in certain kinds of beer. Just be careful! It's typically recommended maintain separate equipment for "clean" beers and "wild" beers to prevent cross-contamination of future batches.



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Water

It may seem like an obvious ingredient, but because water makes up the vast majority of beer, it's a critical one. There are four key aspects of water that relate to homebrewing: pH, hardness, alkalinity and residual alkalinity, and “flavor” ions. All four aspects affect brewing.



The colloquial terms “hard water” and “soft water” come from the cleaning industry. The term “hard” means that it is hard to raise a lather due to the chemical binding of the soil-binding sites in soaps by calcium and magnesium ions.



Adjuncts

Adjuncts are another source of fermentable sugars for adding alcohol to your homebrew. Adjuncts are often used as a cheaper alternative to malted grains or to produce a lighter, less malty beer, but they can just as easily lend their own unique character to beers brewed with them—oatmeal stout, anyone?



Rice has been used as a brewing adjunct in the United States and Britain since the 19th century. Varieties of rice used specifically for brewing are bred to have nearly no flavor or aroma.



Finings

A fining agent is a compound added to beer to improve clarity. Fining agents work by attaching themselves to contaminants and cause them to rapidly settle to the bottom of the fermenter. They may be added either at the end of the boil or in the fermenter, depending on what fining agent is used.



Historically speaking, clear beer is a recent invention. Attitudes towards beer appearance began to change as clear glassware became more widespread, thus spawning a search for improved clarity.



Equipment Essentials

Fermenter

A vessel is needed to hold the wort as it ferments into beer. There are many types of fermenters, each with its own pros and cons.

Airlock & Bung

An airlock is inserted in the top of a fermenter and allows carbon dioxide, a byproduct of fermentation, to escape the fermenter without letting contaminants in. Depending on the fermenter, a bung is sometimes needed to secure the airlock. Without an airlock, pressure in the fermenter could cause the lid or bung to pop off, or worse, the fermenter to explode, leaving you with a sad mess.





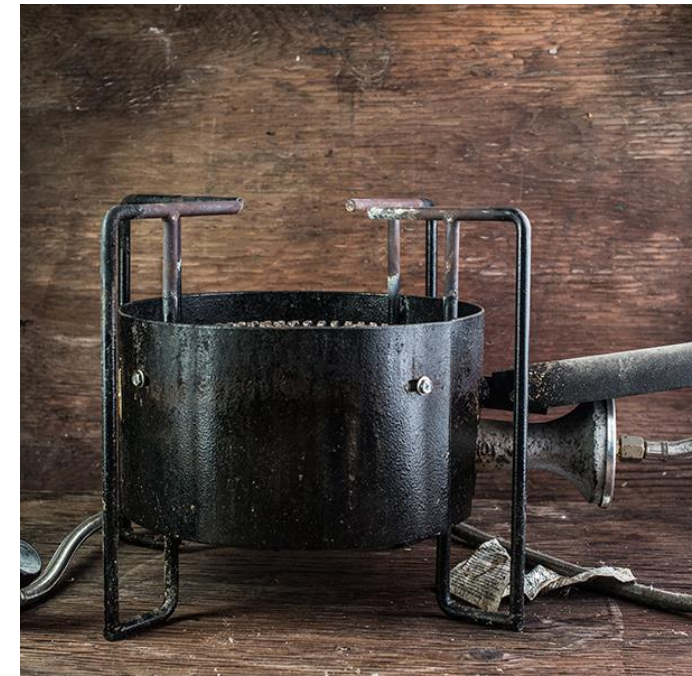
Equipment Essentials

Heat Source

You'll need a heat source that's powerful enough to heat up your pre-boil volume in a timely manner (a watched pot never boils, right?). The stove in your kitchen should suffice for smaller amounts, while a turkey fryer or another powerful heat source works well for larger batches.

Siphon/Tubing

A siphon and tubing is a great way to streamline moving hot wort or finished beer around without the hassle and mess of lifting and pouring (and spilling!) large quantities by hand. Quick tip: an auto-siphon is a type of siphon that creates a vacuum to pump liquid from one vessel to another without introducing too much oxygen or other contaminants into the beer.





Equipment Essentials

Cleaner

There are homebrew-specific cleaners available that you can find at your local homebrew shop, but unscented dish cleaner also works. Avoid products with scents, which can stick around after cleaning and cause off-flavors and aromas in your beer.

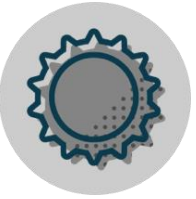
Sanitizer

Different than cleaner, sanitizer ensures there are no microorganisms that could spoil the goods on your brewing equipment after you clean. There are homebrew-specific, no-rinse sanitizers available at your homebrew shop, but a proper dilution of 1 oz. bleach per gallon of water (8 mL/L) can be used followed by a thorough rinse.

Hydrometer

A hydrometer is used to measure the gravity, or sugar density in wort and beer. You technically don't need a hydrometer to brew beer, but measuring gravity lets you closely monitor fermentation and calculate specifications like alcohol content. You'll also need a vessel to hold the sample for measurement.





You Might Haves

Stirring Spoon

During the mash and boil, stirring is usually required for a variety of reasons. Any spoon capable of reaching the bottom of your brew pot and mash tun will suffice. Plastic, wooden, and stainless-steel spoons are all commonly used.

Measuring Cup

Any measuring cup can be used to measure the appropriate water volumes.

Strainer

When transferring (racking) the wort from the brew pot to the fermenter, some homebrewers choose to run the liquid through a strainer to prevent hops and other solids from being transferred. A fine-meshed colander or straining bag will do the trick.

Thermometer

It's important to pitch the yeast at a specific temperature, typically below 75°F (24°C), and a thermometer is a good indicator. Be sure to acquire a calibrated thermometer that can withstand high temperatures.





Mashing

BIAB (Brew in a Bag) Only

The ideal BIAB bag fits around the circumference of your brew pot without resting on the bottom to prevent scorching (does it smell like something is burning?). The bag will hold most of the grain sediment. You may purchase pre-made bags at your local homebrew store, but many homebrewers put that DIY attitude to use and make their own.

Mash Tun (Needed for Batch Sparging)

A mash tun is used to hold heated water and grain at a specific temperature during the mash and to separate wort from the grains.

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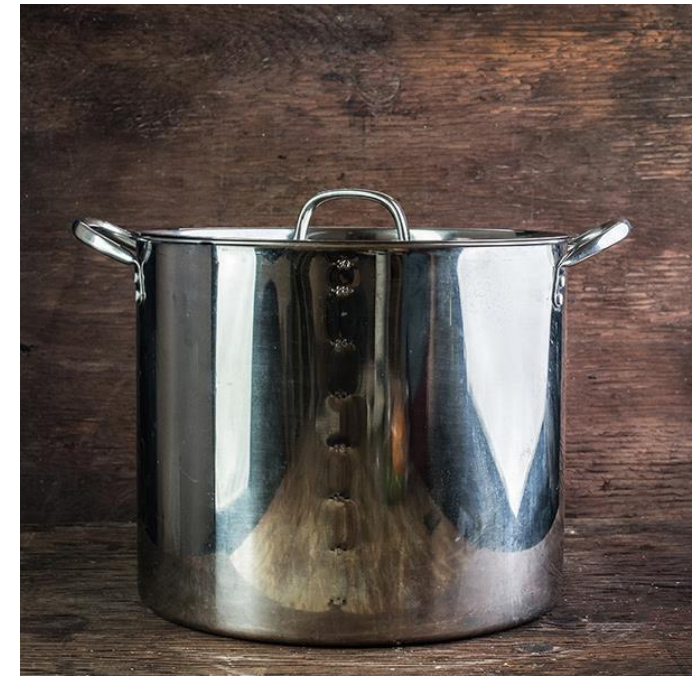
Mashing

Sparge Pot (Hot Liquor Tank)

An additional pot is used to prepare sparge water in all-grain brewing. You add sparge water to the mash tun to rinse the grain of any sugars left behind after you initially drain wort from the mash. A sparge pot (sometimes called a hot liquor tank, or HLT) can be used, but is not necessary. The same goes for BIAB brewing, too.

Pitcher

A pitcher or small pot with a handle is used for the recirculation process that settles the grain bed and clarifies the wort, a process known as vorlauf. Vorlauf prevents an overt amount of grain sediment from making it into the boil by recirculating the wort until the grain bed settles before transferring the wort to the brew pot.





Bottling

Bottle Brush

It is crucial to thoroughly clean and sanitize bottles before using them for homebrew. A bottle brush will make quick work of dislodging any sediment inside bottles that can ruin your beer. You can also go with the “brushless method” which involves soaking the bottles in a bleach solution for five minutes and thoroughly rinsing out the bottles afterwards.

Bottles

Glass beer bottles are needed to package your homebrew. Bottles can be purchased from a homebrew shop or you can simply reuse beer bottles after thoroughly cleaning and sanitizing them. Do not use twist-off bottles, as they’re difficult to seal airtight.

Bottle Caps

Purchase unused crown caps from a homebrew shop. Make sure you are purchasing the correct size, as some larger bottles require larger caps.





Bottling

Bottling Bucket

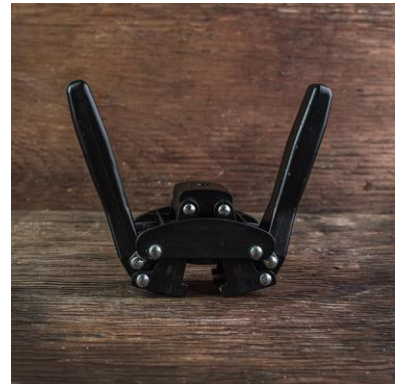
A bottling bucket is like a plastic fermenter with a spigot near the bottom. The fermented beer is racked into the bottling bucket with a sugar solution, and a bottle filler is attached to the spigot for easy bottling. Make sure to clean and sanitize your bottling bucket before use!

Bottle Filler

A bottle filler (wand) is a hard plastic tube with a spring-loaded tip used for filling bottles. When the spring-loaded end of the tube is pushed against the bottom of a bottle, it allows beer to flow through. Remove from the bottom of the bottle and the flow stops.

Bottle Capper

A special device is needed to seal bottle caps. A basic twin-lever capper is typically used and will get the job done, but some homebrewers have bench-mounted cappers for speed and ease.



From the Essentials to the Extreme





All-In-One Brewing System

- Kettle
- Mash tun
- Integrated pump
- Bluetooth controller
- 120 or 240 VAC
- Very light weight
- Counterflow chiller





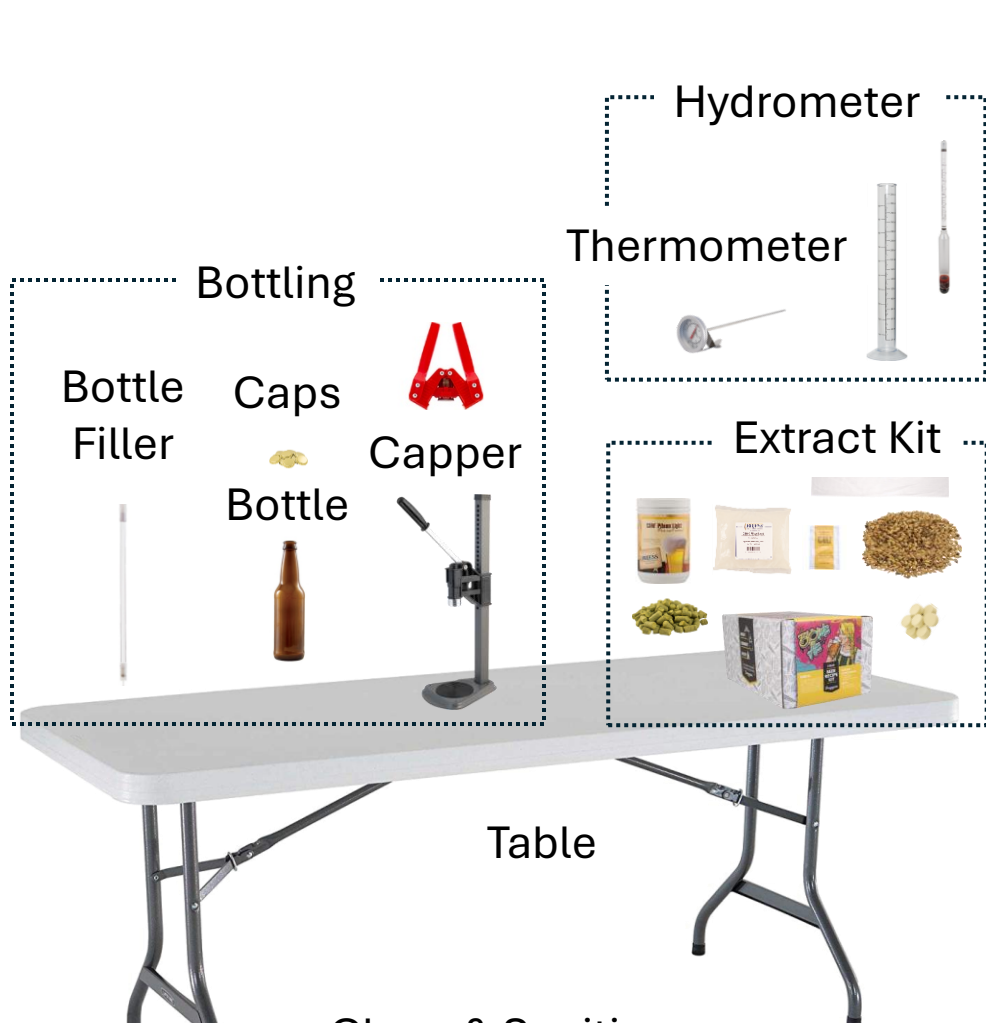
All-In-One Brewing System





All-In-One Brewing System

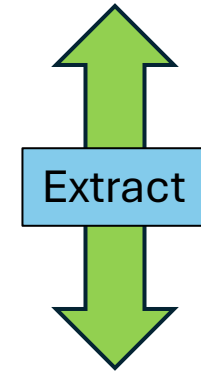






What's the Process?

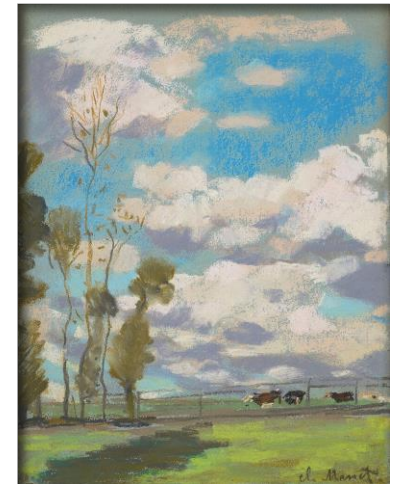
- Milling
 - Beer making starts with the milling of brewing grains
- Mashing
 - Mashing looks like porridge making, converting starch to simple sugars
- Lautering
 - Extracting the sugar water (wort) from the mash, sparging (rinsing)
- Boiling
 - Converts sugars and hops into flavors
- Fermentation
 - Yeast use aerobic and anerobic processes to multiply and convert sugars into CO₂ and ethyl alcohol
- Filtration and Conditioning
- Packaging





Brewing Methods

- Extract
 - Sugars already concentrated in liquid or dry form
 - Shortest brew time
 - Good beer but not “OMG WoW!”
 - Paint-by-numbers, limited palette of paints
 - Repeatable
- All-grain
 - Sugars need extraction by milling, mashing, lautering, and sparging
 - Longest brew time
 - Ability to make “OMG WoW!”
 - Blank canvas and full palette of paints, spatulas, brushes
 - Repeatable with good process and records





Brewing Methods



Adding Liquid Malt Extract (LME)



Preparing to hoist the 20-pound grain basket during an all-grain brew session



Bottling Methods



Joy is using a “beer gun” to fill cleaned and sanitized bottles

George waits for the filled bottle to do the capping with an old-style “bandit arm” capper using sanitized caps

Capped bottles are placed in the case for storage in warm area 68-72 degrees for natural carbonation to develop

Fore-ground is the source keg connected to beer gun

Low level sink in back

All actions accomplished at table level.



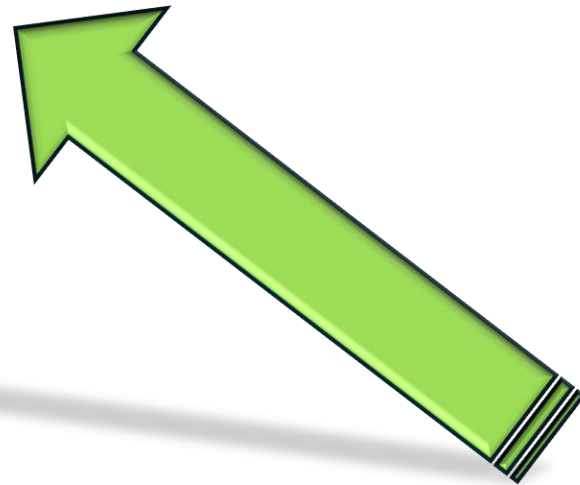
Sensory versus Physical

- Sensory ability more important than physical ability
- Chemistry, biology, mathematics
- Right brain (artsy, creative)
- Left brain (analytical, methodical, logical)
- Proper process control and methods



Diacetyl (2,3-butanedione)
Mercaptan (ethanethiol)
Lightstruck (3-methyl-2-butene-1-thiol)
Hydrogen Sulphide (H₂S)
Caprylic (octanoic or caprylic acid)
Butyric (butyric acid)
Grainy/Husky
Banana (Isoamyl Acetate)
Metallic (ferrous sulphate)
Sour
Catty (p-menthane-8-thiol-3-one)
Cheesy (isovaleric acid)
Sweet
Dimethyl Sulfide (DMS)
Acetaldehyde
Oxidation
Phenolic
Musty (2,4,6-trichloroanisole)(TCA)

Checking the Specific Gravity (SG) using a refractometer





Physical Tasks

- Opening packages
 - Use scissors
 - Unscrew lids
- Lifting up to 35 lbs
 - Gallon of water 8.345 lbs 3.78 kg
 - Grain absorbs 0.125 gal/lb or 1.043 lbs
 - 15 lbs grain = $15_{\text{dry}} + 15.65_{\text{saturated}} = 30.65$ lbs plus weight of basket
- Moving equipment up to 30 lbs horizontally and vertically short distances
- Dexterity
 - Grasping
 - Stirring
 - Turning
 - Pushing
 - Pulling
- Mobility
 - Around brewing space
 - Bending at waist



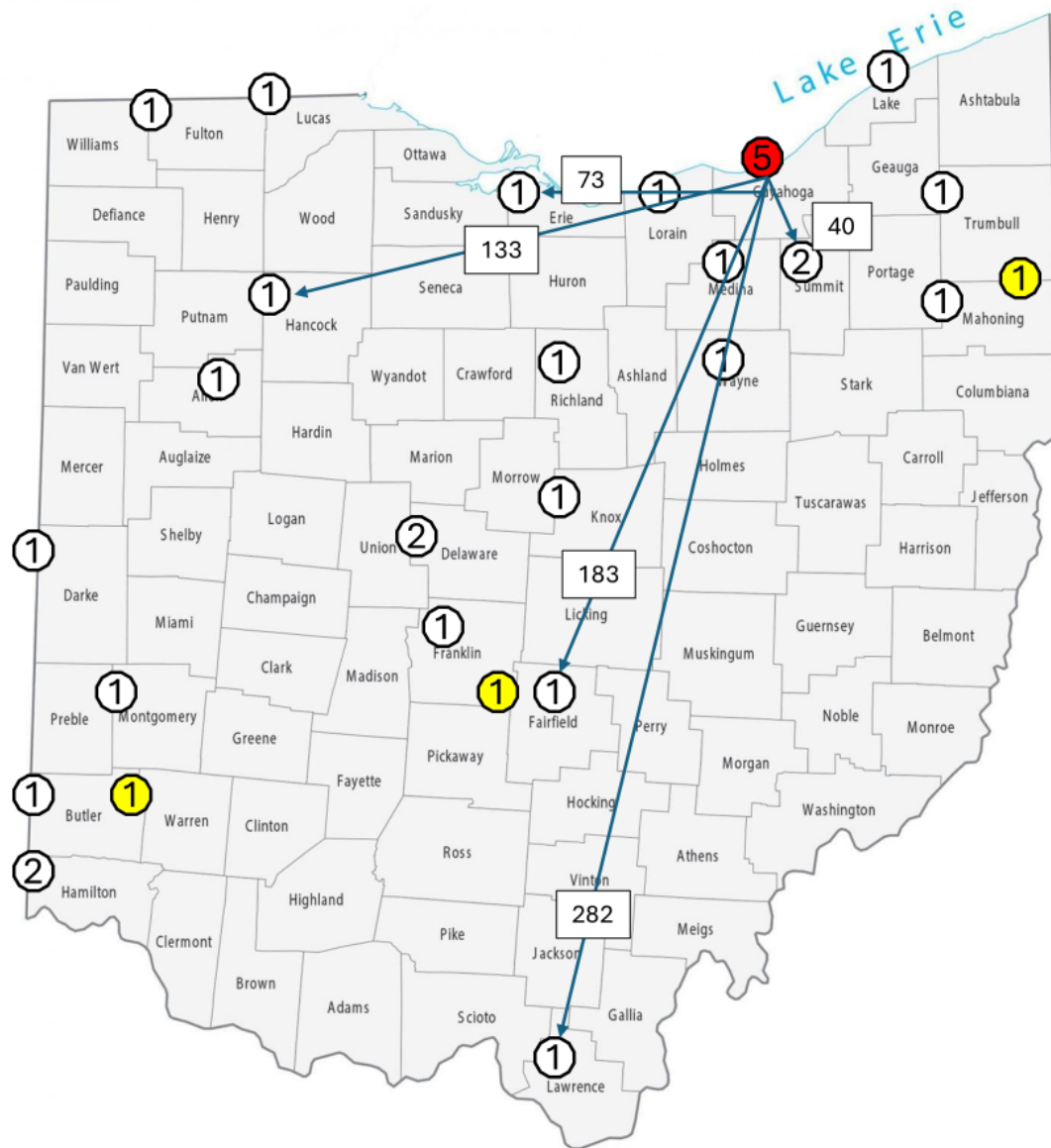
AHA Clubs

- Over 1,600 registered homebrewing clubs in USA
- 263 homebrewing clubs in California
- Brew Buddies





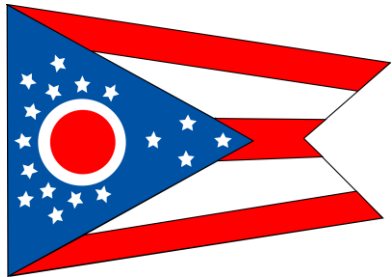
AHA Clubs in Ohio



Ohio Homebrew Club Distribution

Club Cities	Count1	Miles
Euclid (PVA HQ)	0	0
Cleveland	4	12
Mentor	1	14
North Ridgeville	1	34
Brunswick	1	37
Cuyahoga Falls	1	40
Akron	1	44
Warren	1	58
Wooster	1	71
Sandusky	1	73
Youngstown	1	76
Struthers	1	83
Mansfield	1	91
Mount Vernon	1	115
Toledo	2	126
Findlay	1	133
Steubenville	1	135
Delaware	1	138
Sylvania	1	138
Powell	1	150
Columbus	1	153
Wauseon	1	153
Pickerington	1	167
Lima	1	182
Lancaster	1	183
Miamisburg	1	233
Versailles	1	234
Monroe	1	249
Hamilton	1	253
Cincinnati	2	260
Proctorville	1	282

Club Counties	Count
Allen	1
Butler	1
Butler/Warren	1
Cuyahoga	5
Darke	1
Delaware	2
Erie	1
Fairfield	1
Fairfield/Franklin	1
Franklin	1
Fulton	1
Hamilton	2
Hancock	1
Jefferson	1
Knox	1
Lake	1
Lawrence	1
Lorain	1
Lucas	3
Mahoning	1
Mahoning/Trumbull	1
Medina	1
Montgomery	1
Richland	1
Summit	2
Trumbull	1
Wayne	1



Club	email	City	County	State	Phone
Society of Akron Area Zymurgists (SAAZ)	president@saazakron.com	Akron	Summit	OH	
The Brewing Ring In Medina (The BRIM)	webmaster@thebrim.org	Brunswick	Medina	OH	(440) 251-9384
Bloatarian Brewing League	bbl.pres@gmail.com	Cincinnati	Hamilton	OH	(513) 662-1431
Cincinnati Malt Infusers	treasurer@maltinfusers.com	Cincinnati	Hamilton	OH	(513) 417-0332
Brewly Homebrew Club	brewlyus@gmail.com	Cleveland	Cuyahoga	OH	
Ohio Mead Group (O. M. G.)	pklammerspam@hotmail.com	Cleveland	Cuyahoga	OH	(216) 225-2524
Society of Northeast Ohio Brewers	snob@beersnobs.org	Cleveland	Cuyahoga	OH	
The Homebros	homebroscleveland@gmail.com	Cleveland	Cuyahoga	OH	(513) 607-6220
Scioto Olentangy Darby Zymurgists (SODZ)	secretary@sodz.org	Columbus	Franklin	OH	
Kent Guild of Brewers	kentguildofbrewers@gmail.com	Cuyahoga Falls	Summit	OH	
Delaware Ohio Homebrewers (DOH!)	dohbeer@gmail.com	Delaware	Delaware	OH	(740) 229-9240
Buckeye Chapter PVA	maddis@buckeyepva.org	Euclid	Cuyahoga	OH	(216) 731-1017
Hancock County Home Brewers Assoc.	wolfie@wolfiesnuts.com	Findlay	Hancock	OH	(419) 423-1355
Butler County Brewing Society	brewers@butlercountybrewing.org	Hamilton	Butler	OH	
Lancaster Fairfield Homebrew Crew	lancasterfairfieldhomebrewcrew@gmail.com	Lancaster	Fairfield	OH	
Allen County Homebrewers Association	marcreinicke@outskirtsbrewco.com	Lima	Allen	OH	(567) 204-1474
Mansfield Homebrew Club	mansfieldbrewclub@gmail.com	Mansfield	Richland	OH	(330) 465-6206
Little Mountain Brewers	lmhba.club@gmail.com	Mentor	Lake	OH	(440) 667-2683
Dayton Regional Amateur Fermentation Technologists	draft.homebrew@gmail.com	Miamisburg	Montgomery	OH	(937) 505-0128
Middletown Area Society of Homebrewers (MASH)	mashohio@gmail.com	Monroe	Butler/Warren	OH	(513) 265-0160
Mount Vernon Brew Club	hello@mountvernonbrewclub.org	Mount Vernon	Knox	OH	
Beer Research and Engineering Working Group : NG (Brew:NG)	nicholaslantz@gmail.com	North Ridgeville	Lorain	OH	
Brew Crew		Pickerington	Fairfield/Franklin	OH	
Homebrewers of Powell (HOPs)	hello@powellbrewers.com	Powell	Delaware	OH	(614) 419-9997
Greater Huntington Homebrewers Assoc	janezalew@gmail.com	Proctorville	Lawrence	OH	(740) 886-8828
Firelands Homebrew Club	firelandshomebrewclub@gmail.com	Sandusky	Erie	OH	
H.O.O.C.H. / Homebrewers Of Ohiovalley Club House	hoochhomebrew@gmail.com	Steubenville	Jefferson	OH	(740) 381-0116
Youngstown Area Homebrewer`s Of Ohio(YAHO)	pumphouse@excite.com	Struthers	Mahoning	OH	(330) 755-3642
KAPS Brewery	p.ashburner12@gmail.com	Sylvania	Lucas	OH	(419) 344-6029
Frogtown Hoppers	frogtownhoppers@gmail.com	Toledo	Lucas	OH	
Glass City Mashers	glasscitymashers@gmail.com	Toledo	Lucas	OH	
Midwestern Ohio Brewing Society (MOBS)	mobshomebrewclub@gmail.com	Versailles	Darke	OH	
Brewers Of Ohios Zymurgists Enclave (BOOZE)	boozebrewers@aol.com	Warren	Trumbull	OH	(330) 503-8090
Tri State Herf, Beer, and Brew	lou2row@go.com	Wauseon	Fulton	OH	
Wayne County Brew Club (WCBC)	w8av@aol.com	Wooster	Wayne	OH	(330) 465-6206
Mahoning Area Grain Mashers Association (MAGMA)	magma@magmahomebrew.net	Youngstown	Mahoning/Trumbull	OH	(330) 792-4233



Next Steps

- Gauge interest within PVA membership
- Connect with [local brew clubs and suppliers](#)
- Visit local homebrewing stores
- Encourage store and brewery accessibility standards
- **Form your own club**
- **Join American Homebrewers Association (AHA)**
- Brew, learn, compete, enjoy
- Relax, have a homebrew!





Summary

- Brewing has been a human activity since time immemorial
- All that is needed is desire to learn, equipment and a glass to enjoy your own homebrew with friends and family
- Good brewing is more sensory than physical
- Adaptive Brewing provides access to all who want to learn to brew, builds community, enriches lives, creates relationships, engenders a sense of pride in accomplishment

Adaptive Brewing Program

