



Tied House and Hermitage Brewing Company Brewing Process

Ingredients

There are four basic building blocks used to make beer – malted grain, hops, yeast, and water.

Malt. The word malt actually refers to the natural maltose sugars that brewers extract from certain grains (mainly barley) in the process of making beer. Of the four main ingredients, it is the grain that contributes the most to the finished beer. Things that the grain imparts on the beer include: its color, its underlying flavor, its sweetness, its body, its head of foam, and its mouthfeel (the textural qualities of beer on your palate and in your throat). Most importantly, it's those natural sugars that will feed the yeast, producing alcohol and carbon dioxide during fermentation.

Hops. *Humulus lupulus* is a vining plant that can reach up to 25 feet tall on commercial hop farms. Small, cone-like flowers grow from the vines, containing the bitter acids, resins, and essential oils that contribute bittering, flavoring, and aromatic qualities to beer. Hops also act as natural clarifying agents and bacterial inhibitors. The bitterness from hops balances the malt sweetness, dries out your palate, and makes you want to take another sip!

Yeast. Yeast is a living single-celled fungus, and one of the simplest forms of life, but can have the greatest impact on the final flavor of a beer. It is the one ingredient responsible for the fermentation process in brewing. Fermentation is the natural conversion of sugar to alcohol. Yeast consumes the sugars provided by the malted grains, gives off equal parts ethyl alcohol and carbon dioxide, and then reproduces by cloning itself. Multiply this by many billion times and you have fermentation. While there are many varieties of yeast in the world, there are two main types of yeast used in making beer: Ale yeast and Lager yeast. Ale yeast ferments much quicker at higher temperatures, producing bolder flavors reminiscent of flowers, fruit, and butterscotch. Lager yeast was cultivated over hundreds of years to perform better in cooler conditions. Colder temperatures cause the yeast to ferment much slower, producing a smoother flavored beer. Both ale and lager yeast have many different strains available to modern brewers, each with their own ideal fermentation conditions and imparted flavors.

Water. The water used to make beer is referred to as brewing liquor. While most people don't think about water as an important factor in the beer-making process, it makes up more than 90% of an average beer. While any water that tastes good can make good

beer, the mineral content of brewing liquor can have a big effect on the flavor and fermentation properties of a beer. Many of the great beer-making cities of the world, including Munich, London, and Plzen, have developed because their water supplies support those particular styles and flavors best.

Process

The first step in the brewing process involves malting the grains so that the brewer can access the sugars trapped inside the grain to feed the yeast. Malting companies soak the grain in water just long enough so that they begin to germinate. As the seedlings begin to sprout, the starches contained within them break down into simpler sugars, mainly maltose, which can be consumed by the yeast, and will contribute the color, flavor, sweetness, body, mouthfeel, and foam mentioned earlier. It also causes the production of enzymes that will later be used by the brewer during the mashing process.

Once these changes begin to take place in the grain it is removed from the water and placed in a kiln to dry, temporarily stopping the process and preserving the malted grain for future use. Kilning at low temperatures produces pale malt, a light colored base malt, and the main ingredient in most of our beers. Different kilning procedures can also be used to create specialty malts, which are used by brewers to create the many different styles of beer found throughout the world. Using higher temperatures caramelizes some of the sugars in the malt, producing caramel malt, which is used to add orange to reddish color and sweet flavors to the beer. Much higher kilning temperatures produces chocolate, black, and roasted malts, which impart dark brown to black color to the beer and bolder flavors ranging from dark chocolate to roasted espresso. Only after the grain (mostly barley) has undergone the malting process does it become *malt*, or *barleymalt*. The malt is then packaged or loaded onto huge trucks and shipped to breweries.

The silo behind Tied House holds about 30000 pounds of pale malt, while the silo outside of Hermitage holds about 52000 pounds of American pale malt. The different base and specialty malts (including different grades of malted barley but also wheat, rye, oats, rice, corn, and others) combined together for a particular beer is called a grist. The grist is sent through a mill, which cracks open the grain hull, and moves into the grist hopper, where it waits until its time to brew.

On brew day, the grist is combined with hot brewing liquor and sent into the *mash tun*, where it will sit for between 20 minutes and 2 hours at a temperature of 150 degrees Fahrenheit. At this point it looks and smells like a giant pot of oatmeal. The temperature is very important during this step. 150 degrees is the perfect temperature to reactivate the enzymes that were turned off during the kilning process, so they can go to work cutting up the starches into simple sugars that the yeast can eat.

At the end of the mash, the sweet, sugary liquid (called sweet wort) is drained off

the grain bed through a false bottom in the mash tun and transferred to the *brew kettle*. In the brew kettle the sweet wort is boiled for between one and three hours. Hops are added to the kettle at different points of the boil. Adding hops early in the boil imparts bitterness to the beer, while adding hops during the later part of the boil lends piney, fruity, or flowery flavors and aromas to the beer.

After the end of the boil our brewers use pumps to cause the liquid (now called bitter wort or hopped wort) to whirlpool, naturally forcing larger particles in the liquid, such as hops and protein globs, to collect in the center of the kettle. A short rest allows for those particles to settle to the bottom. Next, the hopped wort is pumped through a heat exchanger, which very quickly lowers the temperature from 212 degrees to under 80. Once cooled below 80 degrees the wort is injected with pure oxygen and sent into one of our fermenting vessels, where the temperature is lowered further (45-55 degrees for lagers, 60-70 degrees for ales). The yeast for a batch is added, or *pitched*, into the fermenter with the cooled wort, and the whole mixture is sealed inside for 13 days to 6 weeks, depending on the beer style. Most of the beers brewed by Tied House and Hermitage are ales, taking between 2 and 3 weeks to complete fermentation.

When the yeast has finished consuming all of the available sugars the beer is lowered from fermentation temperature (typically 60 – 70 degrees) down to 32 degrees for a period of cold conditioning, which causes the yeast to fall to the bottom of the fermentation vessel where we can harvest it and re-pitch it into a new batch. At this point most of our beers are filtered (although some, like the New World Wheat, are not) and moved into another vessel, called a *bright tank*. Here we force CO₂ into the solution, carbonating it. All that is left now is to package the finished beer into bottles or kegs for delivery to our customers, or into the big serving vessels at the pub, which feed directly into our tap system.

CHEERS!!