



CHEERS!

Beer is for everyone! A historical tradition that spans 5,000 years, it is one of the few beverages enjoyed by princes and labourers alike - from Rolling Rock to Cantillon, beer is the booze of the people! This packet is an introduction to the essential components, techniques, and history of brewing.

## WHAT'S IN IT

Malt. Hops. Yeast. Water...Pizza

Malt - Barley (*Hordeum Vulgare*) :

Barley provides the fermentable product that is the base of all beer. Though barley may look like wheat, barley is unique in that it has a low protein content and a high starch content. Not all barley is created equal, british malts like golden promise, maris otter, and maritime varieties are highly respected. Many beer styles require grains such as wheat, rye, and oats used in combination with barley to achieve creamier textures or spice.

- Wheat beers can have between 30%-70% wheat in the grain bill
- Rye beers can have up to 60% rye in the grain bill
- Malt character is one of the most important elements to consider when pairing beer and food. Hops may be the spice but malt is the body of the beer.

Hops - (*Humulus lupulus*):

Hops are the main spice of beer, beer without hops (AKA wort) would be a gross syrup. In the late summer hop vines flower and create hop cones (like little pine cones!) At the base of the petals inside the hop cone lies a yellow powdery substance called Lupulin. Lots of different spices have been used over the course of history, in medieval times beer would have tasted more like a medicinal digestive than a party favor. The lupulin won out because it helps preserve the beer and provides bittering to balance the flavor.

Hops can be thought of like grape varietals in wine; where and how the hops are grown come together to create a signature flavor and dimension. Some hops are better for adding bitterness to beer, others are more desired for their aroma.

Some Hops to know:

- Czech Saaz - bittering hop/floral aroma
- Perle - bittering
- Mandarina Bavaria - orange like aroma
- English Golding - woody and floral
- English Fuggle - hay and fennel aroma
- Citra -big citrus character
- Chinook - bittering/riesling, limey
- Centennial - Bittering

- Columbus - bittering
  - Mosaic - bittering/Grapefruit
  - Nelson Sauvin - bittering/Sauvignon blanc, passionfruit
  - Southern Cross - bittering/citrus pine
- Yeast - (*Saccharomyces Cerevisiae*/Ale Yeast/bottom fermenting/top-fermenting) and (*Saccharomyces Uvarum*/ Lager yeast/bottom-fermenting):

All hail mighty yeast! If any of you know a brewer, they will tell you one of the most arduous parts of brewing is maintaining your yeast population. In process yeast looks like a giant living pancake. Once fermentation has begun it doesn't stop, brewers and associate brewers are tending to it 24/7.

Yeast is a single celled organism, a part of the flora family, you can find it anywhere you'll find life. There are hundreds of different strains, people have built their brewing careers around discovering new strains. Yeast is a beer's most defining element, you cannot craft hefeweizen without a hefeweizen yeast strain; that same thing applies to pale ales, stouts, even Bud Light Lime.

Yeast strains are separated into two families, *Saccharomyces Cerevisiae* and *Saccharomyces Uvarum*, Ale yeast and Lager yeast. Ale yeast is the wild guy of the two families - a very active strain, ale yeasts ferment at higher temperatures and very quickly. Because of this high activity all of the spent yeast cells rise to the top. This is why ale yeasts are referred to as top-fermenting. Ale yeasts impart a rich range of flavors to its beers, from bubble-gummy to christmas cookies to guava and mango.

Lager yeasts ferment best at very cold temperatures, they impart a crisp and clean finish allowing the malt and hops to shine. Because the yeast is slow to ferment and less active; the spent yeast cells fall to the bottom of the fermentation vessel. This leaves the beer less cloudy and why it's called bottom-fermenting yeast.

- Water

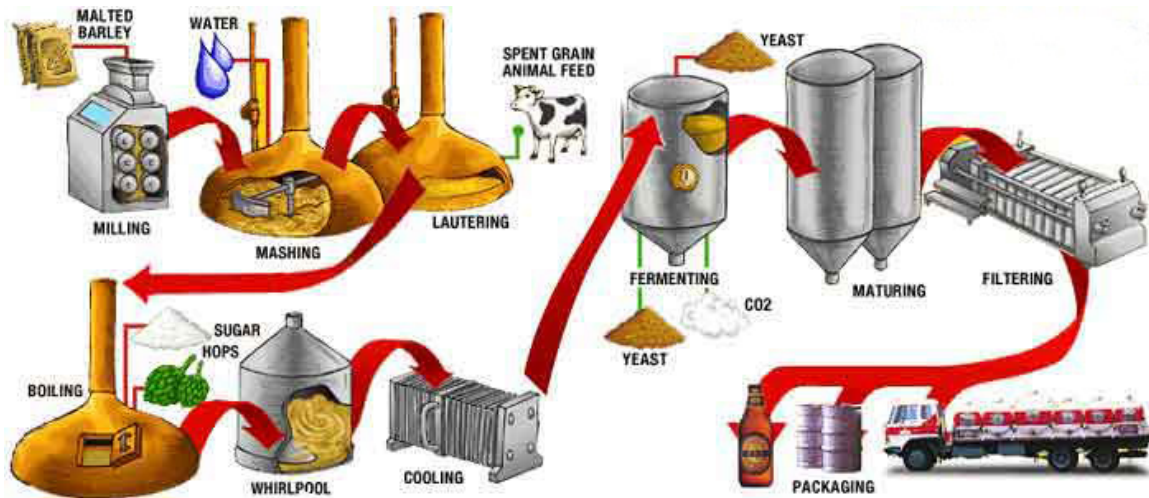
How rich the water is in mineral character will affect the mouth-feel and perceived bitterness in beer. The hard water of Burton upon Trent is famous for it's crisp and clean finish; while in Pilsen the water is soft, muting the hop bitterness. In most breweries they treat their water to get the desired effect, while some craft brewers have access to their own well water.

#### Pizza and Other wacky adjuncts -

As I mentioned earlier in the hops section, beer has been spiced with all sorts of fruits and herbs over time. That tradition continues today, the United States and Belgium are famous for their creative additions. Often in the USA, adjuncts are more cost saving than culinary choices. The most notorious cost saving adjunct is corn. Corn is used as a substitute in almost any commercial beer, it's cheaper and doesn't impart any flavor-perfect for the mass market.

My favorite example of wacky adjuncts is Evil Twin's "Big Ass Money Stout". To capture local flavor this beer was brewed with Norway's favorite frozen pizza and then money because Norway is well, rich.

## HOW IT'S MADE



### Phase 1

#### STEP 1 - MILLING

Malted barley comes in large sacks. Milling is the process of cracking the malted barley to expose the sugars (starch) that will be extracted for fermentation. The resulting finely-ground malt is called the grist.

#### STEP 2 - MASHING

Mashing is the process of turning the grist into a sweetened liquid. Mashing converts the starches, which were released during the malting stage, to sugars that can be fermented. The milled grain is dropped into warm water then gradually heated to around 167° F in a large cooking vessel called the mash tun. In the mash tun, the grain and heated water mix creating a cereal mash to dissolve the starch into the water, transforming it into sugar.

#### STEP 3 - LAUTERING

This is the part of the process when the mash is strained into a clear, sweet liquid called wort. (Pronounced wert.) The mash is usually circulated a few times through a lauter Tun and sparged with water to make sure the yield of starches from the sugar is maximized.

### Phase 2

#### STEP 4 - BOILING

The spent grains (grains used during the mash) are filtered out and the wort is transferred to the brew kettle to be boiled. The boil involves many technical and chemical reactions. During this stage, important decisions will be made affecting the flavor, color and aroma of the beer. Certain types of hops are added at different times during the boil for either bitterness (in the beginning) or aroma (afterwards). The wort is boiled for one to two hours to sterilize and concentrate it, and extract the necessary essence from the hops. Spices and other additives are added during this phase.

#### STEP 5 – WHIRLPOOL

The boiled wort is separated from the trub, which is sediment in the beer.

#### STEP 6 - COOLING

The wort is transferred quickly from the brew kettle through a device to filter out the hops, and then onto a heat exchanger to be cooled. The heat exchanger basically consists of tubing inside of a tub of cold water. It is important to quickly cool the wort to a point where yeast can safely be added, because yeast does not grow in high heat. The hopped wort is saturated with air, essential for the growth of the yeast in the next stage. At this point, sanitation is very important, because the beer will not be boiled again.

### Phase 3

#### STEP 7 – FERMENTATION

After passing through the heat exchanger, the cooled wort goes to the fermentation tank. The brewer now selects a type of yeast and adds (pitches) it into the fermentation tank. This is where the "real magic" of brewing happens; the yeast eats the sugar in the wort and turns it into alcohol and carbon dioxide. This process of fermentation takes around ten days. The wort finally becomes beer. Each brewery has its own strains of yeast, and it is these that largely determine the character of the beer.

#### STEP 8 - RACKING

The beer has now been brewed and fermented, but it can needs to be improved through maturation. During this phase, the brewer moves, or racks, the beer into a new tank called the conditioning tank. If the beer is to be barrel aged, the beer will go into barrels instead of the conditioning tank. The brewer then waits for the beer to complete its aging process. The taste ripens. The liquid clarifies as yeast and other particles settle.

#### STEP 9 – CARBONATING, FILTERING, PACKAGING

Next the beer is carbonated and filtered. The beer may be force carbonated or bottle-conditioned by adding yeast and possibly sugar. Filtering gives the beer a sparkling clarity, but not all beer is filtered. The beer is moved to a holding tank where it stays until it is bottled, canned or put into kegs. Filling techniques ensure air does not come into contact with the beer.

## \*IMPORTANT TO NOTE!

### BARREL-AGING

It has become come back into fashion to further age beer in wooden barrels. Before the advent of stainless steel, wooden barrels were all that brewers had and it wasn't . Today many brewers let beer rest in barrels to pick up new flavors and aromas. Unused barrels can impart a vanilla-toasty character, just as they do to your Chardonnay. Barrels that previously contained wines or spirits imbue the beer with flavors of the barrels' previous liquid. Barrels that are intentionally not sterilized provide excellent homes to wild yeasts and bacteria, and thus will give its beers that beloved funky and tart character. Different types of barrels make for dramatically different effects and flavors. Some breweries will ferment the beer in barrels, but many more age the beer in barrels after fermentation has completed. If the brewer wants the beer to be especially funky and tart, they may add wild yeasts and bacteria to the unsterilized barrel, setting the stage for a wild good time.

### Important Moments in Beer History!

- Germany
  - Reinheitsgebot (The German Purity Law) 1516
- England
  - Industrialization, early 18th century - Porter
- Belgium
  - Wallonia - the birthplace of Trappists Breweries
- USA!
  - Craft beer explosion (1976 - today)

### SOURCES

American Homebrew Association  
The Brewmaster's Table  
YCHHops.com  
Brewers Association