

By Brew Mart

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# An Introduction to Hops

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# What Are Hops?

**Hops are little conical flowers from the hop vine. They contain essential oils that can be used to add flavour and bitterness to beers and lagers.**

Hops are bred and farmed across the western world. Each year they are harvested, dried and packed into sealed containers to keep fresh. They can then be distributed around the world for home brewers and breweries alike, to make their favourite beers with.

A dried hop flower has numerous properties. The main properties wanted by brewers are found in the lupulin gland. The lupulin gland contains the oil resins which confer bitterness, antimicrobial properties plus the aroma and flavour. The alpha acid in the lupulin imparts the bitterness. Lupulin is a stiff oily substance that is sticky to the touch. Within the plant kingdom, lupulin has unique and complex chemistry. It is comprised of several volatile oils, which formulate the flavours used in beer.

These oils and acids are what provide a wide range of aromas and flavours from hops. Research into this field is constantly developing. Researchers quickly found hundreds of different compounds and continue to find and develop more.

Hop Flavours and aromas, develop and change during the latter stages of growth, through harvesting, kilning and storage. Hop aromas in finished beer also change as beer ages.

There are no single formulas for flavouring with hops. Brewers often ask for a chart or checklist that matches oils with flavours. Apparently, it is not that simple.

Since the 60's much effort and research has gone into identifying the compound responsible for "hoppy" beer, without success. In 1992 Blitz-Weinhard Brewing concluded, "Hoppy aroma is probably not attributable to a single component but rather to the synergistic effect of several compounds."

The development and definition of "hoppy character" have never been clear. With the continuing development of new hop strains providing a greater

range of aromas and flavours, with greater variations in intensity, there has never been a more difficult time to isolate "hoppy character."

However, this has not stopped the beer makers in their craft. Many credit American "craft" brewers for driving interest in the new aromas and flavours commonly found in American IPA's. I don't believe it is a coincidence that many of these new aromas and flavours came from newly developed American hops. and I am quite pleased that this has prompted a response from UK growers and others to continue the development. Long live Hops! :)

# What Are Hops Used For?

**Hops are primarily used for adding aromas or bitterness to beers and lagers.**

In For the Love of Hops they provide a concise list of seven positive attributes hops contribute in brewing;

- Bitterness
- Aroma
- Flavour (a combination of aroma and taste)
- Mouthfeel
- Foam & Lacing
- Flavour stability
- Anti-microbial, inhibiting the growth of organisms that damage the flavour and appearance of beers.

According to Wikipedia “The first documented use of hops in beer is from the 9th century, though Hildegard of Bingen, 300 years later, is often cited as the earliest documented source.” before this people used spices and herbs to flavour beers. The British Hop foundation states “In those early days, the sole reason for using hops was to preserve the beer in good condition: the bittering effect was reluctantly accepted by Englishmen.”

Hops were also essential in getting beer to British troops in India. Imperial or India Pale Ales (IPA's) are characteristically heavily hopped with high alcohol content, so the beer could survive the trip to India. Hops having an antimicrobial quality and alcohol being a sterilant.

With modern refrigeration and transportation, hops are no longer required for preserving the beer. Today, they are primarily used for adding flavour, aroma, and bitterness. Adding depth and complexity to beers, and allowing brewers to explore and express their craft with greater variety and technique.

Hops can broadly be divided into three categories. Bittering, Aroma and Dual Purpose. This is mainly based on the Alpha acid percentage. 0-5% is typically aroma hops 5-10% dual-purpose and 10% plus bittering hops. This is because the high alpha acid hops are more efficient at bittering. The low alpha acid hops do not bitter efficiently.



# How are Hops Used?

**Hops can be used at 5 different stages in the brewing process, to attain 5 separate effects on the beer. The severity of the effect can be adapted by increasing or decreasing the amount of hops used, or the time the hops are in situ.**

## **Mash Hopping**

Mash hopping is where the hops are added directly to the mash tun. The hops are usually placed on top of the grain bed during sparging. This method provides a better overall balance and character to the beer, and almost no bitterness. Which makes it very good for milds, stouts, etc, but not so good for IPA's

Mash hopping is seldom used today, primarily because it requires a comparatively large quantity of hops, for a minimal addition of flavour. Because the hops are never boiled, no alpha acids are released, meaning minimal or no bittering takes place, and most of the flavours of the essential oils are lost in the boil.

## **First Wort Hopping**

First wort hopping is where the hops are added to the boil at the start of the lautering process. The hops remain in the mash during the boil, enabling the alpha acids to be released, contributing "hoppy" bitterness.

## **Bitter Hopping**

Bittering Hops are hops added at the boiling stage. Depending on the level of bittering required, brewers will adapt the hop variety, the quantity of hops and the time the hops are

in the boil. The higher the alpha acid content, the more hops, and the longer they are left in the boil, the more bitterness will be imparted.

## **Late Hopping**

Late hopping is where the hops are added in the last 5-15 minutes of the boil. Though late hopping will add a small amount of bitterness to the beer, the primary purpose for late hopping is to add aroma and flavour from the essential oils. The effects of these essential oils are lost if boiled for too long. Depending on the hop/oils in question, these oils can be boiled off in 10-20 minutes. That is why they are added at the end of the boil.

## **Dry Hopping**

Dry hopping is done after the beer has fermented. Hops are added to the beer either in the fermenter or keg and left for a period of days or weeks, depending on the strength of the hop character required. No bitterness is added by dry hopping, only aroma, and flavour from the essential oils. Again the intensity can be increased by the quantity of hops used and the length of time they are used.

There are also different types of equipment that can be used to add hoppy character, like the Hop Back and the HOPNIK

According to Stan Hieronymus, the author of *For the Love of Hops*, All 35 breweries of the Rock Bottom Breweries group made the same beer, an IPA, but varied the time and manner of the hop addition. "The exercise provided brewers with a better understanding of the

impact of different hopping schemes." "Each beer received the same significant hop dose for 90 minutes and 30 minutes. Breweries then followed one of four procedures.

1. added one pound of Amarillo per barrel at the end of the boil, with 50 minutes of post-boil residence.
2. Added one pound Amarillo per barrel at end of the boil, 80 minutes post boil residence.
3. Added 1/2 a pound of Amarillo per barrel at the end of the boil, with 80 minutes post boil residence, and 1/2 pound per barrel as dry hops.
4. Dry-hopped with one pound of Amarillo per barrel, with no additional kettle addition.

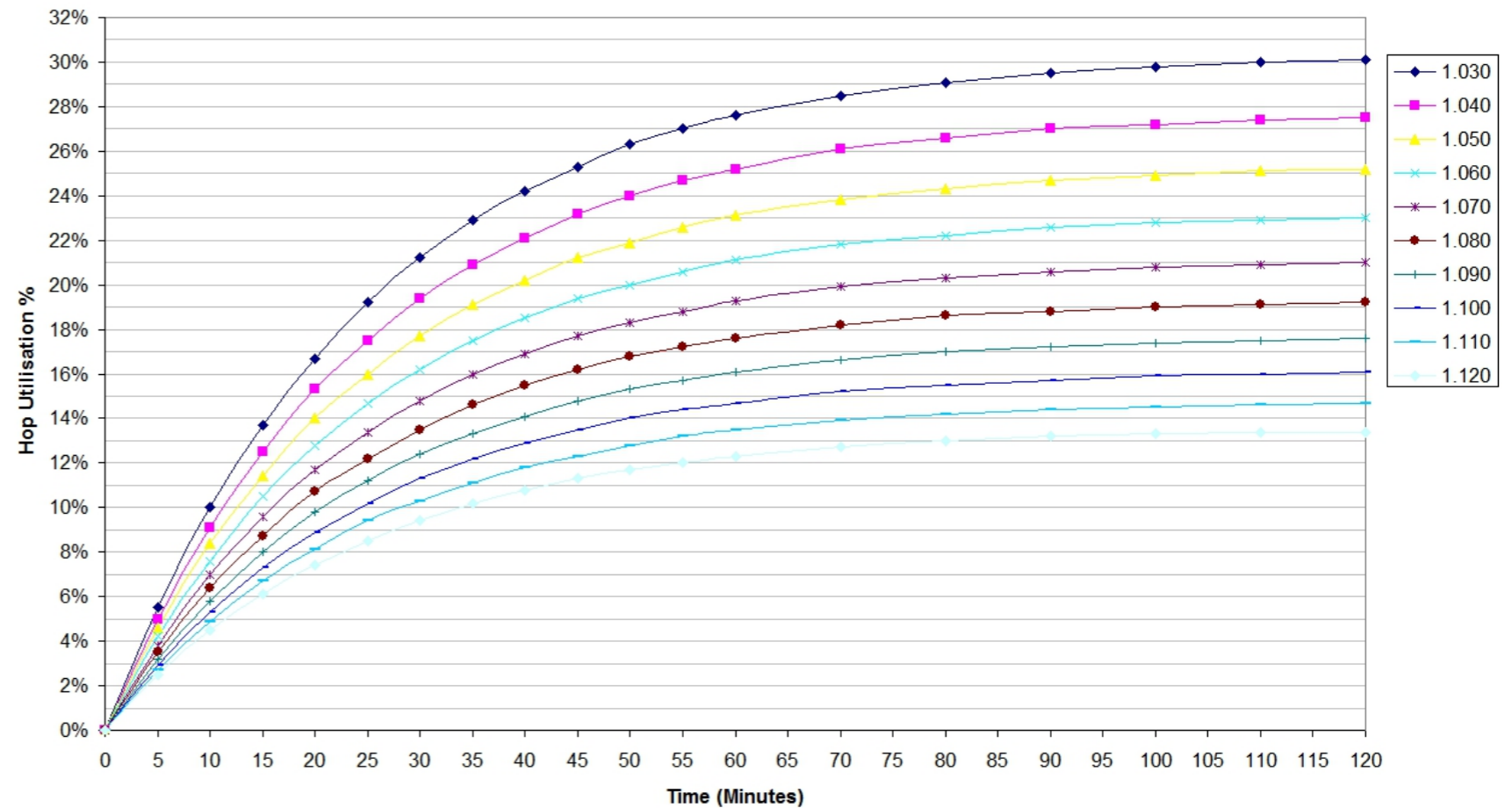
A sensory panel that included 34 experienced tasters later evaluated the beers based on seven characteristics: perceived bitterness, the intensity of hop aroma, the intensity of hop flavour, malt character, citrus notes, fruity notes, and grassy-vegetal notes. In *Assessing the results* the brewery cautioned that these were intensely hoppy beers and that amarillo is a very distinctive hop. Nonetheless, the results were statistically significant and resulted in several conclusions:

- Longer post-boil residence (procedure 2) resulted in more hop flavour, aroma, and perceived bitterness than shorter.
- Longer post-boil residence resulted in more hop flavour than dry hopping, and that hop flavour is best developed in the kettle.
- There was no apparent relationship between measured bitterness and hop flavour or hop aroma. “this result also brought into question the usefulness of using IBU as a method of measuring the hop character of very hoppy, IPA-style beers.”
- A combination of late hopping and dry hopping (procedure 3) resulted in greater hop aroma than longer late hopping. However, it appeared there was a diminishing return for additional quantities used in dry hopping.

Little wonder dry hopping has become so important at many breweries.”

The utilisation chart opposite, based on a chart by Glenn Tinseth, has been a useful guide for home-brewers for nearly 20 years.

Utilisation as a function of Boil Gravity and Time (Palmer's data)



# Common Hops

## In Home-brew



**Goldings**; The most well known of English hops. Has spicy, honey and earthy characteristics.

Alpha: 4-8    Flavour Intensity: 6



**Fuggles**; Another well known English hop. Has grassy, minty and earthy characteristics.

Alpha: 4-7    Flavour Intensity: 6



**Northern Brewer**; A popular German hop. Has spicy, resinous and herbal characteristics.

Alpha: 5-9    Flavour Intensity: 6



**Citra**; The poster child of American “flavour” hops. Has characteristics of mango, tropical fruit and lime.

Alpha: 11-14    Flavour Intensity: 9



**Cascade**; Also an American flavour hop. Has floral, lychee and citrus characteristics.

Alpha: 5-9    Flavour Intensity: 9



**Simcoe**; Another well known American hop. Has pine, grapefruit and passionfruit characteristics.

Alpha: 11-15    Flavour Intensity: 9



**Chinook**; Again, a well known American hop. Has grapefruit, citrus and pine characteristics.

Alpha: 11-15    Flavour Intensity: 9

