



Basic Distilling Instructions

Mens Gear and Beer
- Suppliers of Homebrew Products -

www.mensgearandbeer.com.au

**UNDER AUSTRALIAN LAW, DISTILLATION OF
ALCOHOL WITHOUT A LICENSE IS ILLEGAL**



**IT SHOULD BE NOTED THAT UNDER AUSTRALIAN LAW
DISTILLATION OF ALCOHOL WITHOUT LICENSE IS ILLEGAL**

Introduction

Distilling alcohol is not difficult as long as the basic procedures are followed. Following are the five basic steps involved in distilling alcohol. Each one will be explained in more detail in the subsequent pages.

Step 1 - Fermentation

Fermentation (called wash) involves mixing up a sugar wash (8kg sugar or 9kg dextrose & 20lt water) in a fermenter and adding yeast. The yeast eats the sugar and converts it into alcohol.

Step 2 - Distilling

The process of separating the water from the alcohol that has been fermented in the sugar wash is known as distillation. The fermented wash is added to the still. The still heats the liquid and allows the alcohol to boil off above 78.4°. The alcohol is cooled and collected from the still.

Step 3 - Dilution

The spirit collected from the still should be in the range of 75- 95% alcohol. This is too strong for drinking or filtration. The spirit needs to have some water added to dilute it to 40%. Using an alcometer to measure the % of the spirit, we can determine how much water needs to be added to the spirit to dilute it down to 40%

Step 4 - Filtering

The 40% spirit needs to be filtered through activated carbon to remove any unwanted tastes and smells. This is done easily using a carbon filter system or a straight-through carbon filter.

Step 5 – Add Essence to your spirit

With your filtered 40% spirit you can make hundreds of different spirits and liqueurs. Simply choose a flavour essence and a base, and mix as directed. The final results can be improved with the addition of glycerine to smooth the final product and oak to produce an authentic oak taste.

FERMENTATION

Fermentation is the process of yeast eating sugars and converting them to alcohol and other compounds. This is the first stage in making spirits. All the alcohol in the spirits we make is created in the fermentation stage. The distillation process simply separates the alcohol from water and other compounds. Therefore, it is very important that a good fermentation occurs to get a good result from distillation.

All the equipment used in the fermentation process will need to be cleaned and sterilised prior to use. Proper sterilisation will prevent possible bugs getting into the wash and causing an infection, which will ruin the wash. You will need to sterilise the fermenter, lid and O-ring, airlock, grommet, tap and spoon. Remove the O-ring and grommet from the fermenter lid so they can be properly sterilised as well. Any jugs, buckets or hoses used should also be sterilised prior to use.

To clean and sterilise the equipment, add two teaspoons of Brewers Steriliser per 5 litres of warm water in the fermenter and mix to dissolve. Using a soft cloth (don't use abrasive scourers as they may scratch the plastic), clean all the equipment. Do not forget to remove and clean the tap and the thread on the fermenter. A toothbrush is handy for getting into small places and cleaning the threads. Put the lid on the fermenter and give it a good shake with the sterilizing solution inside. Drain the steriliser. Rinse all equipment very well with clean water and allow to drain.

Add 20lt of water at the correct temperature to your fermenter. The temperature of the water is important and will vary depending on the time of year and climatic conditions. If the water temperature is too hot, it may damage or kill the yeast. If it is too cool, the yeast may not work properly. As a rule of thumb, in the middle of summer, the water temperature needs to be cooler (25 to 30° C). In winter, the water temperature needs to be warmer (30 to 40° C). Use the thermometer on the side of the fermenter or your glass thermometer to measure the temperature of the water. You may need to add or remove some hot/cold water to achieve the desired temperature. Splash the water as much as possible when pouring it into the fermenter. This will help to add oxygen to the wash, which the yeast needs to start quickly.

When the water temperature is right, add 8kg sugar, or 9kg of Dextrose, 2kg at a time and mix vigorously until it dissolves. A paddle attached to your electric drill will do the job perfectly. Mix the wash until you cannot feel or hear the sugar scratching on the bottom of the fermenter.

When mixed, open the sachet of Turbo yeast and sprinkle it over the top of the liquid. Seal the fermenter and fit the airlock. (If the O-ring seal is lubricated, it is easier to get an airtight seal) The airlock should be half filled with clean water (preferably cooled boiled water). When the fermenter is sealed properly, the water in the airlock should sit at two different levels. If the water does not sit at two different levels, the lid is not properly sealed.

The yeast is a living organism and needs to be kept in a comfortable temperature range (around 25°) to work best. Choose a spot for the fermenter where the temperature will be relatively stable, to ensure no large fluctuations in the fermenting temperature. This is important for the health of the yeast and ultimately the quality of the resulting spirit. In summer, select a cooler spot, and in winter a warmer spot is best. In very hot or cold weather, extra cooling or heating may be required.

Temperature control for heating and cooling can be done using a fridge controller for cooling and a heat pad / belt for heating. Talk to your local homebrew store for the right solution for you. Alternately, you can use temperature-tolerant yeast, which operates through a large temperature range (15 to 40°). However, all Turbo yeasts will produce their best results if kept around 25° C.

Initially, the yeast will multiply until there are a sufficient number of cells to start eating the sugar. The wash will change its appearance from a translucent liquid to a murky, milky looking liquid. The yeast will then eat the sugar and convert it to alcohol and other compounds. This will generally start within 12 hours or less under normal conditions.

One of the other compounds produced during fermentation is Carbon Dioxide, which will bubble through the airlock if the lid is sealed properly. If the lid is not sealed properly, the gas will escape through another point and no bubbling will be evident in the airlock. Fermentation still takes place - it simply means the gas has found another way out. Other visual signs of fermentation are some foaming and bubbling appearing on the surface of the wash and a high tide mark when the yeast subsides a little, later in the fermentation.

There is no fixed time for fermentation to be completed. Many variables will affect the time taken. Generally, a standard wash of 25lt volume using 48hr Turbo yeast and fermented at 25° will take approximately 7 days. Do not be concerned if fermentation takes a little longer. In very cold weather, if the wash is not heated and falls well below 20°, the yeast may fall out of suspension and fermentation may stall. If this occurs, heat the wash up to 25° with a heat pad or belt and stir the yeast with a sterilised spoon to get it working again. Yeasts will work at different speeds depending on the sugar load and temperature. Some yeasts can also generate substantial heat in the wash, which can pose problems in very hot weather. Ask your local homebrew store for advice on the right yeast for your brewing conditions.

To determine whether fermentation is complete, use a hydrometer to measure the specific gravity of the wash. The specific gravity refers to the density of the liquid. The hydrometer will have a scale starting at around 0.980 (less dense) at the top and 1.150 (very dense) at the bottom. To make the figures easier to use, remove the decimal points and think of them as 980 (less dense) at the top and 1150 (very dense) at the bottom. Plain water has a specific gravity of 1000. If we add sugar to it, the density of the liquid will increase, producing a higher specific gravity. Alcohol is less dense than water and therefore has a lower specific gravity than water.

A standard wash will have a starting specific gravity of approx 1130. As the yeast eats the sugar and converts it to alcohol, the density of the wash will decrease and the specific gravity will fall. When the wash is fully fermented, the specific gravity will be around 990 or less and will have an alcohol content of approx 18-20%.

990 is the benchmark specific gravity to aim for with fermentation of sugar washes.

To test the wash, run some out of the fermenter tap into a test tube and float the hydrometer in the fluid. Give the hydrometer a few spins to dislodge any bubbles so it doesn't stick to the sides of the test tube. Take the reading where the surface of the liquid cuts across the scale of the hydrometer.

If something has gone wrong during fermentation, the specific gravity may not drop to 990. This means the yeast has not fermented all the sugar in the wash and the amount of alcohol in the wash will be less than normal. All is not lost. If the specific gravity is stable at 1000 or below (measured twice over two days) and does not drop any further, proceed as normal. The result from distillation will simply be a little less yield than normal.

(If the specific gravity is above 1000 and stable, there will still be large amounts of fermentable sugar left in the wash. This may cause foaming through the top of the still and produce poor quality spirit. In this situation, add **Distilling Conditioner** to the wash in the still and stir in well. The **Distilling Conditioner** will stop the foaming and distilling can proceed as normal)

When fermentation is finished, the wash will still have yeast in suspension and will be very murky. This yeast needs to be cleared before the wash goes into the still to achieve the best quality spirit. If it is not cleared properly, the heating action from the element in the still will react with the yeast and result in inferior spirit. The yeast will fall out of suspension and clear naturally if left for several weeks. This clearing action can be achieved much faster using a clearing agent such as **Turbo Klar**. Using **Turbo Klar**, a wash can be cleared of 95% of yeast in just 24 hours and 99% clearing will occur in 48 hours. **Turbo Klar** consists of 2 sachets labelled Part A and Part B. Remove the lid of the fermenter, add Part A and give the wash a gentle stir with a sterilised spoon. Leave for at least 1 hour, add Part B and give the wash a gentle stir again. Now leave the wash to sit for 24 hours before distilling. After several hours, there will already be a noticeable difference.

DISTILLATION

Distillation is the process where the alcohol (ethanol), created in fermentation, is separated from the water and other compounds. This is done by heating the wash at, or above, 78.4°C in the still. The alcohol boils at a lower temperature than water, so the steam that rises will be mainly alcohol. The steam will rise up through the condenser and fractional distillation will occur.

The heavier compounds that are not wanted will fall back to the boiler and the lighter alcohol will continue to rise to the top of the condenser. The steam is then cooled and condensed back into alcohol.

To assemble the still, fit the condenser to the domed lid of the boiler. Tighten it securely with the nut on the under side of the lid.

Fit the thermometer and bung with a little water, and carefully push the thermometer through the bung. The sensor on the end of the thermometer needs to protrude about 10-15mm through the bottom of the bung, so it is sitting level with the bridge connecting the two parts of the condenser. Firmly place the bung in the top of the condenser. Make sure the thermometer is not touching any metal components.

Place the still on a strong heat resistant base in close proximity to a cold water tap, drain and power point. Empty the fermenter into the still, using the fermenter tap. Try not to disturb the layer of yeast on the bottom of the fermenter - this should be left behind. Adding this yeast to the still will result in poor quality spirit.

Ensure the condenser is tightly attached to the lid and is firmly in place. If it is not, steam may leak out and you will lose some of your spirit. Put the lid complete with condenser, hoses and thermometer on the boiler and tighten the clamp. The condenser has 3 hoses attached to it. One will have a push-on rubber tap adaptor on it. This is the 'water-in' hose and needs to be attached to a cold-water tap. The other hose of similar length is the 'water-out' hose and needs to go to a drain or somewhere where the water can be collected. The small hose is the 'spirit-out' pipe.

Turn on your tap and set the water flow through the still at about 500ml per minute. This can be done by filling a jug to 500mls while timing it. Mark your tap at the point where you achieve this flow rate. The flow does not have to be precise; this is simply a good starting level.

Plug the still in and turn it on. It will take about 45 minutes for the wash to heat to about 30°C.

Once the temperature reaches 30°, it will begin to rise fairly rapidly to 80° (only a matter of minutes), so close attention is needed at this point. When the temperature reaches 65°, start the water running at about 500ml per minute through the still. Don't run too much water at this stage as the temperature will drop and it will take a while to heat up again.

At about 70°C, the still will begin to produce spirit. Collect the first 100ml in a small jug. This spirit is known as the HEAD of the spirit. It is **UNDRINKABLE** and **MUST NOT BE CONSUMED OR RE-DISTILLED**. (It makes a great window cleaner) After the 100mls of Head is collected, replace the small jug with one of the 5lt glass demijohns to collect the quality ethanol spirit. This is known as the BODY. When collecting the spirit, ensure that the collection hose is kept above the level of the spirit in the bottle so it can drip freely. Once the temperature reaches 78 to 80 °, adjust the water flow to keep temperature on the thermometer stable at this temperature.

78° - 80°C is the best temperature range for distillation of ethanol. It is possible to produce spirit at a higher temperature, however the quality will be poorer as a result. Water flow is used to control the temperature of the still and the amount used depends on the conditions on the day. On average, a standard distillation will require at least 200 to 300 litres of cooling water. In cooler weather, less water is required as the ambient and water temperature are lower. In hotter weather, more or cooler water will be needed for temperature control.

When distilling in hot weather, the temperature can be better controlled (and less water used) if you have a fan blowing onto the still, or chill your cooling water. This can be done by running the water through a copper coil sitting in an ice slurry before it goes through the still. This works very effectively and will reduce the amount of water used dramatically. The waste water is totally clean and can be re-used. You can re-cycle your cooling water using a pond pump, but you must ensure the water is able to cool sufficiently before being reused in the condenser.

Once a stable temperature of 78 to 80° is achieved, it will be fairly easy to maintain this temperature for the 3 to 4 hours needed to produce the body of the spirit. In that time, you should produce approximately 4 litres of good quality spirit.

After the 4 litres is collected, the temperature in the condenser will naturally start to rise as the volume of liquid in the boiler is reduced and more water starts to rise as steam. It is possible to simply increase the water flow at this point to compensate for the rise in temperature, however the flow rate of the spirit will slow considerably.

A better option is to collect the 4 litres of spirit at 78 to 80° and then replace the demijohn with another bottle. Allow the temperature to naturally rise up to 90° and collect up to another 1 to 1.5 litres of spirit. This is known as the TAILS. This is lesser quality spirit and should not be used for consumption in its current state. It will need to be distilled again to improve the quality. You can either store all the tails until there is a sufficient quantity to re-distill the whole lot, or simply add the tails to the still when distilling your next wash. This will give an improved result in the spirit percentage from distillation.

After collecting the tails, turn the still off allowing the water to flow for another minute. Carefully undo the clamp on the lid and allow the heat to escape. Leave the liquid in the still to cool overnight and dispose of it when cool.

Caution: Although the condenser may be cool, the base and its contents will still be very hot. Exercise great care when releasing the clamp.

The still will require a minimum of cleaning after distillation. The boiler and lid should be cleaned with a soft cloth and mild detergent and rinsed thoroughly. To clean the condenser, pour a kettle of hot water down the reflux chamber through the ceramics and back flush a little water through the spirit outlet hose. This will prevent any build up of residue in the condenser.

DILUTION

The 4 litres of the spirit collected should be around 75 to 85 % alcohol if everything has gone to plan. To test the strength of the spirit, an alcometer is used. Pour some spirit into a test tube and float the alcometer in it. Take the reading where the surface of the spirit cuts across the scale of the alcometer. The alcometer is calibrated for 20°C and the spirit needs to be tested when it is at this temperature. The spirit will be warm directly after distillation and if tested at higher temperatures, will give distorted results. Leave the spirit to cool naturally or pour some into a cup and place it in the fridge to lower the temperature to 20° prior to testing.

For effective carbon filtering, the spirit will need to be diluted to 50% or less with clean drinking water. Dilution to around 43% is recommended. The filtering process will usually reduce the strength by 2-3%, producing a final strength of around 40% - the normal strength of most commercial spirits.

To work out how much water is needed for dilution a simple calculation can be made:

$$\begin{aligned} &\text{Starting volume of spirit} \times \text{Original \% of spirit} / \text{Diluted \% of spirit} \\ &= \text{Total volume of spirit to be made.} \end{aligned}$$

Subtract the Starting volume of spirit from the Total volume of spirit to be made. The result equals the amount of water needed.

For example you have 4.5litres of spirit at 83% and you wish to dilute it down to 41%.

$$\begin{aligned} &4.5 \text{ litres} \times (83/41) \\ &= 4.5 \text{ litres} \times 2.02 \\ &= 9.1 \text{ litres (this is the Total volume of the spirit at 41\%)} \\ &9.1 \text{ litres} - 4.5 \text{ litres} \\ &= 4.6 \text{ litres (add 4.6 litres of water to the spirit)} \end{aligned}$$

Alternatively, if your spirits has cooled to 20°C, put a clean alcometer in your container, and slowly add water until the alcometer reads about 43%.

FILTERING

The diluted spirit now needs to be filtered to remove any unwanted flavours and smells, caused by fusel oils and other compounds still in the spirit. Fusel oil is the term for higher alcohols and unwanted by-products produced from fermentation. Keeping the wash at the correct fermentation temperature and distilling the spirit at the correct temperature can reduce the unwanted smells and flavours. However, they cannot be eliminated altogether by distillation, hence the need to filter the spirit.

The best ingredient with which to filter your spirit is activated carbon. Activated carbon is used widely for filtration because of its effectiveness, from processing waste water to gold refining to making bourbon. Activating carbon produces carbon that resembles a sponge, with millions of tiny passages and holes in it, and presents a huge surface area for molecules to stick to. The activated carbon can then work as a type of "molecular sieve", trapping the molecules that are larger than ethanol. The molecules become trapped in the pores inside the carbon, and also by surface energies on the carbon. The carbon will therefore not remove ethanol, but will remove larger molecules such as aldehydes, aminos and fusel oils (not good for your health or the taste of your spirit).

Carbon filtering is usually done using either a CarbonFilter System, or a long straight-through Filter, (or some variation of these), filled with activated carbon.

Before you assemble the filter system for use, the carbon needs to be flushed with clean water to remove dust and mineral salts. Mineral salts will be present in the carbon pellets and can be absorbed in the spirit as it filters through the carbon. This can result in a cloudy appearance and sediment in the spirit. The mineral salts are not harmful in any way but they detract from the appearance of the finished spirit. Flushing the carbon with clean water is essential to prevent this from occurring.

Using a Straight-Through Filter

A straight-through stainless steel filter is a three-piece vertical filter with a long straight column of carbon. To wash the carbon in the mid-section of this filter, screw a nut with mesh disc onto the bottom of the middle section of tube. Fill the tube with carbon, and screw a nut and hose onto the top of the section. Insert the tube into a garden hose and wash. When the water runs clean, crimp the hose at the top of the filter, turn it upside down and unscrew the nut with mesh disc.

In the bottom section, place a large filter pad on top of the mesh and fill with filter wool. Screw onto the bottom of the middle section. Turn the two pieces right way up, remove the nut and hose and attach the top storage container.

Make sure the tap is turned off, and then fill the container with spirit. You can place you part empty demijohn into the top of the container. It will not overflow. Let the filter sit for 45 minutes while the middle section fills with spirit. After 45 minutes, turn the tap on so it is dripping at a rate of 2 drops per second into a glass demijohn. Placing a small funnel in the top of the demijohn, directly under the filter tap will help prevent foreign objects getting into your demijohn while the spirit is filtering.

When your filtering has finished, store the spirit in glass demijohns until you are ready to mix your spirit with essence. The spirit will keep indefinitely but make sure the bottle you store it in is sealed or evaporation will occur.

ADDING ESSENCES TO THE SPIRIT

Now comes the best part. The spirit is ready to be mixed with an essence for drinking. There are endless possibilities on the variations of spirits and liqueurs that can be made. A little bit of experimentation with different flavours may be required to find the right mix for you. It is all about personal taste and preference and you can decide the flavour of your favourite tippie to suit you. The spirits and liqueurs can be consumed straight after mixing, however the flavour and smoothness will improve with at least several days aging in the bottle. Try putting a bottle away for several months to make a comparison.

Making Spirits

Select a flavour essence for the type of spirit you wish to make. Mix it as per directions on the bottle/pack with your filtered spirit in a bottle and shake well. Combinations of different essences can be used to create a unique taste in your spirit, though you should avoid mixing more than two straight essences or the flavours may interact in an unexpected way. You can also blend previously made spirits to create different flavours. Additions of glycerine (to remove harshness), oak extract, oaked spirit (spirit with oak chips soaked in it), glucose, and sugar can be made to the spirit to improve the flavour to your liking. The use of these additives is a matter of personal taste. Use as much or as little as you like. However, it is generally better to err on the side of caution and use a smaller amount initially and add more later. Your local homebrew store can help guide you on ways to improve your spirits.

Glycerine

Glycerine is a sweet, slightly viscous liquid derived from vegetable oil. It is used to add smoothness and increased mouth feel to the spirit and can help to take the burn out of some spirits. It is generally used at a rate of 3 to 5ml per litre of spirit, and can be added to any spirit.

Oak

All dark spirits (rum, whisky, bourbon, brandy etc) when made traditionally are water clear when they come out of the still. They are then stored in oak barrels for years to mature. The darker colour, smoothness and enhanced flavour in the finished spirit is a result of maturing in the oak barrel. To get some extra oak flavour and smoothness in your dark spirits, a small addition of commercial oak extract can be used. The oak extract is available in French and American oak in bottles similar to the flavour essences.

Oak barrels can also be used to mature and improve your dark spirits in the same way that a commercial distillery does. Homebrew stores stock oak barrels that can be used for this purpose and also for storing port. It is simply a matter of filling the barrel with the mixed spirit of choice and allowing it to mature for at least 2 weeks. The spirit can be consumed directly from the barrel or it can be decanted into bottles to allow for more spirit to mature in the barrel.

Oak chips can also be used to add an oak flavour and colour to dark spirits. They will also mellow and smooth the spirit. There are numerous varieties of oak chips that can be used. Some of these include French and American oak with differing degrees of toasting. Also available are a range of oak barrel chips that were previously used by commercial distilleries to store spirit in. This range includes Jack Daniels, Jim Beam and Wild Turkey Bourbons, rum and whisky barrel soakers.

French and American oak chips can be used in various ways. You can add a small amount of chips (5 to 10 grams per litre) to a larger volume of spirit (1lt), and then leave them to soak for at least 2 weeks. The longer the spirit remains on the chips the more flavour it will develop. After soaking, pour the spirit off the chips into another bottle. Use a funnel with filter wool to keep the oak particles out of the spirit. This spirit can then be used as part, or all, of the base spirit to make any dark spirit. It will have a slight oak flavour and will be mellower than straight, filtered spirit.

The bourbon, rum and whisky barrel soakers can be used in a similar fashion to this. The resulting spirit will be mellower but it will also have developed the flavour of the spirit that was originally stored in the barrel. Once again, the longer the spirit remains on the chips the more the flavour will develop. Follow the directions on the pack for dilution rates.

French and American oak can also be used to make a more concentrated oak spirit, which is then added, in small quantities to dark spirits. Add 50g of oak chips to a 1125ml bottle, top up with filtered spirit and leave to sit for at least 2 weeks. This will draw an enormous amount of colour and flavour out of the oak. This can then be added sparingly (20-100ml per litre of spirit) to dark spirits.

Glucose

Liquid glucose can be added in small quantities to spirits to improve the mouth feel and smoothness.

Sugar

Sugar can be added to spirits if a sweeter taste is desired.

Making Liqueurs

Liqueurs are made in a similar way to spirits, however most liqueurs are sweeter and thicker in body than spirits. In addition to the filtered spirit and flavour essence, a liquid liqueur base is needed. The liquid liqueur base contains the necessary sweetness and body to give the liqueur the correct taste and consistency. As different liqueurs have varying degrees of sweetness and body, there is a range of different liquid liqueur bases that are matched to the range of liqueurs available.

There is also a cream liquid liqueur base for making cream liqueurs such as Irish cream.

To mix liqueurs, you will need a measuring jug, a funnel and a 1125ml bottle. Most liqueurs will make up 1125ml. Following the directions on the liquid liqueur base bottle, pour the correct amount of filtered spirit into the measuring jug then pour the liqueur base into the bottle. Add to this bottle around half of the measured spirit and shake the bottle vigorously to mix the liqueur base and the spirit. When it has mixed, add the essence to the bottle and rinse the essence bottle with some of the remaining spirit in the jug. Add the remaining spirit from the jug and shake the bottle again to mix. Top up to 1125ml, if needed, with clean water. The liqueur can be consumed straight away, however at least a couple of days maturing in the bottle will give a better result. All liqueurs will get smoother with age.

Enjoy your spirits and liqueurs!

For all your beer, wine and spirit making needs, talk to us.

Mens Gear and Beer

- Suppliers of Homebrew Products -

www.mensgearandbeer.com.au