

BYO Boot Camp

Distilling

Workshop



Aaron Hyde
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An Introduction

Aaron Hyde

- Started homebrewing in 1997
- Started distilling in 2008
- Opened Brewstock Homebrew Supplies in 2009
- Joined Briess Malt in 2014
- Joined Bevie in 2018
- Published How To Distill in December 2021

Currently General Manager – Portfolio & Strategy at Bevie
Live in Auckland, New Zealand

I've spoken at Homebrew Con, Master Brewers Conference, various homebrew clubs and craft brewing guilds, and speaking this year at Craft Brewers Conference on 'Brewstilleries' as a business model.

Institute of Brewing & Distilling certifications in Brewing, Malting, and Distilling.

Other Stuff:

- Originally from Wisconsin- brats, beer, and cheese please!
- Worked a of couple seasons at the NBA
- Also worked in recording studios and as a piano tuner in NYC
- Love to get outdoors to hike, fish and sail
- Have a dog named Willie Mae
- Married for 11 years



A Disclaimer

- Home distilling of spirits for consumption is federally illegal in most countries. (It is not here in New Zealand where I'll be distilling.)
- It is not illegal to sell or own a still most places, though some countries require registration.
- In most states in the United States you can own a still to produce 'non-consumable' products at home. It is possible to get a fuel permit or a small business permit to distill essential oil, water, or other products.
- Please check local laws- there are countries where it is completely illegal to even own a still!



Although rare to pursue home distillers, the second you're selling moonshine, they will take an interest in you. It's all about taxation... and a little bit about public safety. This bust was in South Carolina in 2019.

What Will We Cover Today?

The Process:

1. Mashing
2. Fermenting
3. Distilling
4. Polishing
5. Aging & Flavoring
6. Blending & Bottling

Focus Topics:

- Equipment
- Ingredients
- Spirit Styles & Distilling Recipes

Throughout The Day:

- Terminology
- Tips & Tricks*
- Your Questions!

Let's Jump In!

Please Note:

We have 4 hours which seems like a lot of time, but it may go fast! I'm happy to cover questions as we go but may hold off until later to cover some if it's going to be covered.

Also:

I know a bunch about distilling but I don't know everything! ☺

And:

4 hours can be a long time if you have things to do, people to see, places to be. That's all good- we're recording this for you! Also, you'll get a copy of this presentation to accompany you dive into distilling.

Wait! Let's start a bit out of order...
Let's move the wash and turn the still on!

1. Mashing

The process of converting starches (complex sugars) stored in the seeds of grasses and plants to simple sugars that the yeast can absorb and make into alcohol.

The first, and very necessary step when creating any wash from grain.

- Do you all-grain homebrew? You're mostly there!
- Not interested in whiskies or using grain? You get to skip one of the most difficult steps in the entire distilling process!
 - We'll cover other sources of sugar shortly.

Grain:

Often the generic term for any cereal or pseudo-cereal but also includes malt.

Common Grains Used For Spirits:

- Barley
- Wheat
- Corn
- Oats
- Rye
- Sorghum
- Rice
- Millet

Common Spirits Made From Grain

- Whiskies:
 - Bourbon
 - Scotch
 - Rye Whiskey
- Vodka
- Gin
- Baijiu
- Shochu



1. Mashing – Equipment Checklist

The most important piece will be the mash tun- a vessel that can hold the grains at around 148F (64C) and can strain the grain. Many other pieces may be optional. We'll typically talk 5 gallons/19L.

- Long Spoon or Paddle (Stainless, plastic, or wood)
- Water Pitcher or Sparge Arm
- Mash Tun (Mash Vessel) or Kettle
- Sparge Water Heater (Hot Liquor Tank)*
- High Temperature Tubing
- Grain Mill
- Wort Chiller
- Large Nylon Mesh Bag

You may see some equipment turn up again in other processes.



1. Mashing – Goals and General Info

Our goal is to make sugar our yeast can absorb to make alcohol.

- Will need malt (with enzymes) or ‘exogenous’ (dried, separate) enzymes.
- Enzymes break long-chain sugars into short-chain sugars.
 - Starches (complex carbohydrates) = big sugar molecules
- Malting creates storable, crushable grain with accessible starch and enzymes.
- Unmalted (ie. raw- flaked, grit, cracked) grains contain few accessible enzymes.
- Mashing an all-malt grain bill will simply need a single-step mash.
- A grain bill with at least 30% malt may just need a single-step mash.
 - Will need to assess (pre-gelatinized flakes, high diastatic power (DP) in malt)
- Raw, whole grain is typically cereal mashed.



1. Mashing – Process

Example - an All-Malt (or single malt) ‘Scotch’ Whiskey Recipe

9% ABV Mash Recipe @ 5 Gallons into fermenter:

15 lbs (6.8kg) of Pale Ale Malt (2-Row, Distillers, 6-Row, Ale)

- 18.75 qt (17.75L) of strike water at 160F
 - 1.25 qt per lb, targeting a mash temperature of 148F

Step-by-Step Mash Part 1: Doughing In & Sacchrification

- Clean equipment > determine water > crush grains > heat water > add water to mash vessel > slowly stir in grains > close vessel or manage heat (heater/recirculation) > let sit for 60 minutes.

Using Brewing Software & Calculator:

Brewing software and online calculators will help you make calculations based on the ingredients you’ve chosen, your equipment, and how efficient your mashing system is.

In this recipe, I am assuming 80% efficiency of malt that has 35.5 potential gravity points (starch content) and I’m using yeast that typically gets at least 80% attenuation. This gives me my 9% ABV number.

BeerSmith, BrewFather, Grainfather, BeerTools, Brewer’s Friend and others can be used for spirit recipes.

1. Mashing – Process

Example - an All-Malt (or single malt) ‘Scotch’ Whiskey Recipe

- 13 qt (12.3L) of sparge water at 180F/82C (or cold)
 - Hoping to collect 5-5.25 gallons (19-20L)

Step-by-Step Mash Part 2: The Sparge & Cooling

- Prepare Sparge Water > Check Starch Conversion > Sparge to Kettle or Fermenter > Cool Down Wash

Consider...

- Using malt extract* (*bulk up, thin mash, or no mash*)
- Mash tun that matches you other equipment volumes
- What’s best for you and your budget, space, process, spirit goals



1. Mashing – Cereal Mashing

Example - a typical Bourbon Whiskey

9% ABV Mash Recipe @ 5 Gallons into fermenter:

12 lbs (5.4kg) of Cracked or Grit Corn

3 lbs (1.4kg) of Flaked Rye

1.75 lbs (0.8kg) of Distillers Malt

12 oz (340g) of Rice Hulls

Alpha-amylase & Glucoamylase

21.9 qt (20.7L) of strike water

Step-by-Step Cereal Mash Part 1: Gelatinization & Liquefaction (up to 4 hours)

- Clean equipment > crush malt > add malt and corn to kettle > stir in tap water until complete wet and submerged > bring to boil slowly, stirring > boil until sticky, gooey, mush > turn off heat and cover > add alpha-amylase at suggested temperature > hold in range for 30 -120 minutes, until liquefaction occurs > enter saccharification temperatures by adding strike water at or just under 148F until 21.9 quarts total

Bourbon Mash Bills:

Bourbon must contain 51% corn (by weight) and aged in new oak barrels at no more than 125 proof.

In this recipe, I am assuming only 70% efficiency as it can be more challenging to get as high of an efficiency with raw grains.

You could easily substitute flaked wheat for the flaked rye to make a wheated bourbon.

This recipe contains:

72% Corn Cracked (or Grit)

18% Rye Flakes

10% Barley Malt

Rice Hulls

1. Mashing – Process

Example - a typical Bourbon Whiskey

- 11 qt (10.4L) of sparge water at 180F/82C (or cold)
 - Looking to collect 5-5.25 gallons (19-20L)

Step-by-Step Cereal Mash Part 2: Saccharification & Cooling

- Stir in glucoamylase enzyme, rye flakes, and rice hulls > Hold at 148F for 60 minutes > Let temperature drift downward for 15 minutes > Prepare Sparge Water > Check Starch Conversion > Sparge to Kettle or Fermenter > Cool Down Wash

Consider...

- Corn Flakes (no alpha-amylase/cereal mash)
- Corn Sugar (Thin Mash)
- Malted Rye or Wheat



2. Fermenting

The process of converting simple sugars into alcohols (mostly ethanol) and congeners (esters and acids) with yeast (or bacteria*).

Possibly the first step in the process (second if you mashed). Sugar bases are very common in distilling

- Most simple sugars can be fermented! You can make a spirit out of practically any type of simple sugar.
- Growing fruit? Keep bees? It's time to expand what you can do with the natural bounty.

Substrate:

In this case, a substance yeast can eat. A fancy term for any type of sugar you may want to ferment.

Common Sugars Used For Spirits:

- Dextrose
- Agave
- Molasses
- Apples
- Grapes
- Sugar Cane Juice

Common Spirits Made From Sugars

- Brandy
- Vodka
- Gin
- Rum
- Schnapps
- Tequila



2. Fermenting – Equipment Checklist

The most important piece will be the mash tun- a vessel that can hold the grains at around 148F (64C) and can strain the grain. Many other pieces may be optional. We'll typically talk 5 gallons/19L.

- Fermenter
- Airlock
- Specific Gravity Hydrometer
- Spigot on Fermenter or Racking Cane (Auto-Siphon)
- Transfer Tubing
- Large Nylon Mesh Bag
- Long Spoon or Paddle (stainless, plastic)
- Cleaner & Sanitizer
- Scale

You may see some equipment turn up again in other processes.



2. Fermenting – Goal

Make sure the yeast is happy and healthy: has nutrition, is being kept at the right temperature, has easy access to the sugar, is in a clean environment without contamination (competition).

- Depending on the substrate the yeast may need additional nutrition.
- Distillation fermentations can typically function on the warm (even) hot side of recommended fermentation temperatures.
- Bacteria and wild yeast can affect the final flavor (sometimes positively, sometimes negatively).
- Sugar must be dissolved or removed from the fruit or can completely to be as fermentable as possible.



Turbo Yeasts:

Almost any yeast can be used for wash fermentation. Beer yeast for grain, wine yeast for fruit, but what about turbo yeast?

Turbo yeast is an efficient yeast strain (typically from the wine or distilling industry) with all of the nutrients packed in that your fermentation might need and more! The goal here is a fast and effective fermentation that likely won't get 'stuck'.

2. Fermenting – Process

Example: a typical Sugar Wash

For 5 gallons (19L) of sugar wash

- 15lbs Dextrose (Corn Sugar)
- 150g Yeast Nutrient
- 5 gallons of water



Step-by-step

Clean & sanitize fermenter and all equipment in use today > add 150g yeast nutrient > Fill fermenter with 3 gallons (11 liters) of 92F (33C) water > pour and stir in 15lbs (7kg) dextrose until dissolved > take gravity reading with hydrometer, target original gravity (OG) 1.111(+/- 0.003 > pitch yeast > attach lid > add sanitizer to airlock and place in lid.

2. Fermenting – Process

Example: a typical Sugar Wash

Optional Fermentation Additions:

- Clarifier (chitosan and kieselsol)
- Carbon (wet or dry)
- Additional Yeast and or Nutrient

Step-by-step

Let ferment for 7-14 days* > check gravity, should be at or below 0.994 > if not, add more yeast/nutrient and ferment 5 more days > degas by stirring > add clarifier > add carbon > let sit 3-5 more days > empty or rack off trub into still



3. Distilling

The process of vaporizing and then condensing a liquid so as to be able to collect the (somewhat) separate components.

The step in the process that all spirits must take in one way or another.

The defining step in the process.

- All alcohols can be distilled! Spoiled beer? Sure! Boxed wine? Yep!
- Freeze distillation is distillation, it just looks completely different.
- We rely on a closed unit to create vapor pressure to push and direct the spirit as vapor (steam) out.

Pot vs Column:

A pot still, sometimes called an alembic, leaves more stuff (flavor) in the spirit. A column, sometimes called a reflux, strips and separates more pure ethanol, for a higher ABV spirit.

Typical Pot Still Spirits

- Whiskey
- Brandy
- Gin
- Rum
- Tequila

Typical Column Still Spirits

- Vodka
- Neutral Spirit
- Schnapps

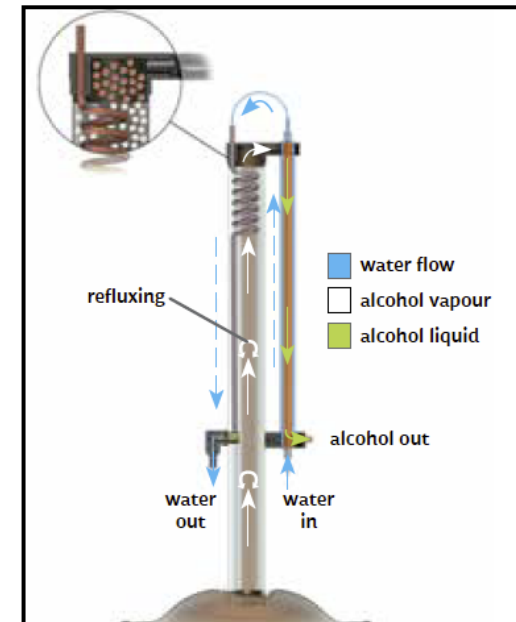
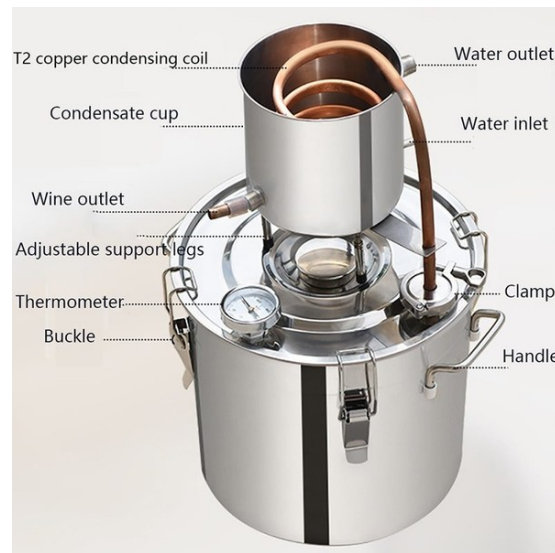
Other Stills

There is a big world of stills in between a traditional pot and column still!

3. Distilling – Equipment Checklist

The still you choose should be determined by the type of spirit you're after. Looking to distill a wide variety? Be sure your still is somewhat modular, and this should be no problem.

- Still (Boiler, Lid Column or Dome, Condenser)
- Heater or Heat Source
- Pump
- Hoses
- Parrot or Test Jar/Cylinder
- Jars and/or Jugs
- Proof & Tralle Hydrometer
- Paste or Tape
- Gin Basket



T500 Diagram

You may see some equipment turn up again in other processes.

3. Distilling – Equipment Checklist

More Stills!



3. Distilling – Goal

To collect as much good tasting and smelling ethanol from the center of the run, the hearts, as possible.

- The run is divided into heads, hearts, and tails. If it smells like paint thinner, you're still in the heads. If things are getting to be a bit like dirty laundry (sweaty clothes), you're in the tails.
- Depending on the still and the spirit, results may vary greatly! There is some learning one must do as the variables for each still and spirit are different.
- You're going to want to make cuts and use all your senses through this process when you can – touch, sight, smell, taste.
- Double and triple distillation are always an option.
- Be picky, a small amount of something bad in your distillate can ruin the batch.

3. Distilling – Process

Example: single run rum (pot still)

- 5 gallons (19L) of wash at around 8% ABV (15lbs blackstrap molasses, 2 TBSP yeast nutrient, 20g rum yeast and 4.75 gallons of water)

Step-by-step

Fill still with 5 gallons of wash (charge) > close still, check seal > heat up to 145F (64C) > dial back heat (power) > collect foreshots* and discard > at 168F (76C) boiler temp turn on condenser water and monitor > set up parrot and cuts jars > run in 250ml (8 oz) even cuts adding a degree F every few minutes (low and slow)> watch for rapid changes in spirit ABV (proof), may signal change from heads to hearts, or hearts to tails > run still until 20% ABV (40 proof)

3. Distilling – Process

Example: single run rum (pot still)

- Checking cuts

Step-by-step

Turn still off > let cool > keep backset for muck pit (dunder*) > make cuts decisions by starting with your most center jar, sample and add to larger jug or aging vessel > alternate working left and right tasting jars and adding to vessel > do not add any jars that are questionable, you should have around 10 jars you're happy with in the center of your run if making small 250ml cuts, possibly more > heads and tails contain alcohol and can be rerun.



3. Distilling – Process

Making a second distillation (spirit run)

- Not happy with the quality of your first run? Take all your collection jars (but still toss foreshots and anything below 20% ABV) and run it again. This first run is now your stripping run.
- For cleaner flavor, a second run can be done on a pot still, though it's typically not necessary on a column still (though a column can be used for a second run). It will typically have less smearing.
- A second run is also recommended for gin or rum to infuse with botanicals or flavor.
- Be sure to bring your alcohol below 40% for safety reasons and still efficiency. I like to dilute to 35% ABV (70 proof).
- A feints run* is a collection of heads and tails and can make a unique spirit all its own.

4. Polishing – Equipment Checklist

- Filter Housing
- Active Carbon
- Jug or Collection Vessel
- Silicone Tubing

You may see some equipment turn up again in other processes



4. Polishing – Process

Example: Neutral Spirit

- 2 Gallons of 40% ABV (diluted down from reflux still)

Step-by-step

Rinse 500g carbon with 1 qt (1L) of clean water > Repeat until water comes out clear > Add spirit to the filter and let sit in contact for 5 minutes allow spirit to fill and settle in filter > open filter valve to allow 2 to 4 drops out per second > allow to run until filter is empty

- For a more gentle, light polishing, run the filter faster.
- No filter? You can add 500g carbon to a bucket and stir daily for 7 days, then empty the spirit (this method is not as effective).

5. Aging

The process of letting spirit sit on oak or in oak barrels for an extended period of time to enhance the flavor of the spirit

This step is a requirement in almost all dark (brown) spirits.

- If you are looking to make whiskey outside of white whiskey or moonshine, you'll need to age on oak.
- Oak comes in numerous forms- chips, cubes, chunks, spirals, staves, barrels, they can all work!
- If you're using a barrel be prepared to take care of it, and the spirit. The more headroom the more you'll give away as the 'angel's share'! It's about 1-3% lost per year in a barrel to evaporation (around 40% empty after 20 years!)
- 100-140 proof are typical for aging spirit.
- If using chips, cubes, etc- around 20g of oak per gallon (3.7L) is a good starting point.

Aging on Wood:

Although oak is the most common, and required for many spirits, other woods are starting to be experimented with.

Typical Aged Spirits

- Whiskey
- Rum
- Brandy
- Tequila

Charred vs Toasted Wood

Raw wood won't give spirit color.

Charred and toasted are two different treatments. Charred is 'charcoaled', turned black, toasted is browned to a specific level.



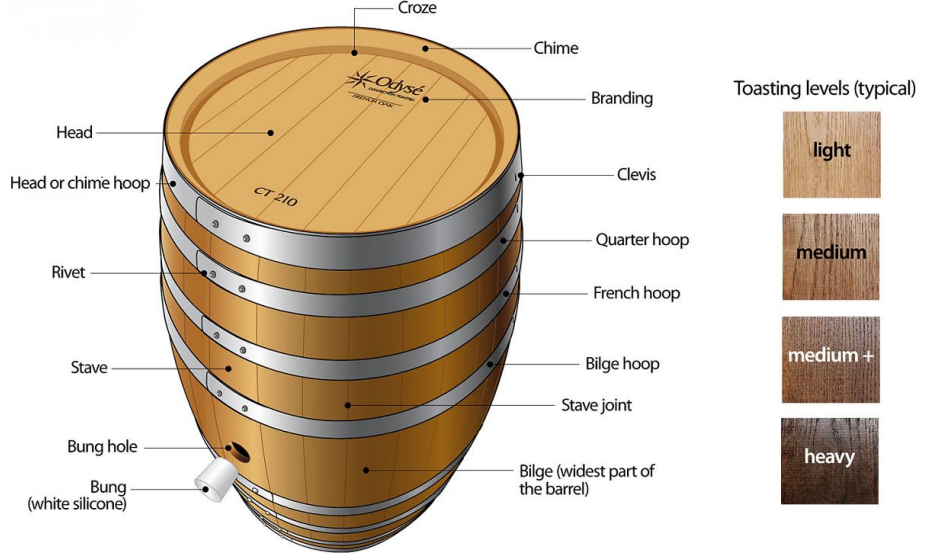
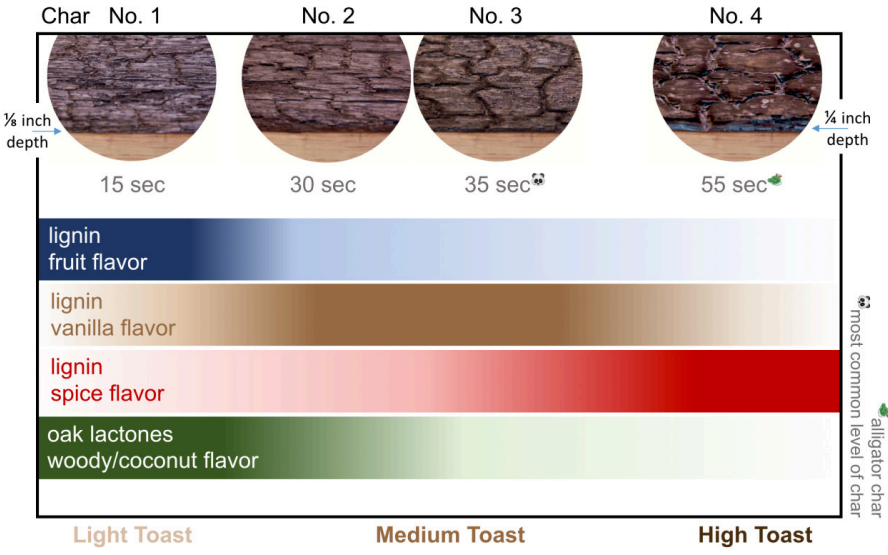
5. Aging – Equipment Checklist

- Barrel or aging vessel
- Oak aging product
- 100-250ml Test Jar Cylinder
- Proof & Tralle Hydrometer
- Nylon or Muslin Mesh Bag*

You may see some equipment turn up again in other processes.



5. Aging – Equipment Checklist



5. Aging – Process

Example: single run rum

Step-by-step

Take collected spirit and cut to desired aging proof (110 in this instance) > add to glass jug > add 20g of dark toast oak chips directly or to a mesh bag> close vessel and store in cool dry place for 3 months > check rum's color and flavor development > determine if it should continue to age or be blended or bottled

- If you're not doing a large amount of spirits and want a barrel find a small one.
- Aging may not include oak, but may just include infusing or steeping botanicals, fruit, or some other flavor enhancer. Experimentation is key.

6. Blending & Bottling

The final steps in the process. Many people drink with their eyes so be sure the packaging is appropriate.

When your spirit is done aging, or if it's a clear spirit off the still, it's time to bottle.

- You can always leave your spirit in the jug or the barrel and tap it from there, it's up to you!
- Try making multiple spirits or aging your whiskey on a variety of woods at different proofs so you can use one of the distiller's greatest tools-blending.
- Waxing a bottle doesn't just look nice, it helps keep the spirit in!
- Spirit bottles range from 187ml to 5L! Most common are 500ml, 750ml, and 1L.

Blending Spirits:

If you are lucky enough to have more than one whiskey or rum aging, blend spirits can be one of the more enjoyable steps.

Typical Blended Spirits

- Whiskey
- Rum
- Tequila

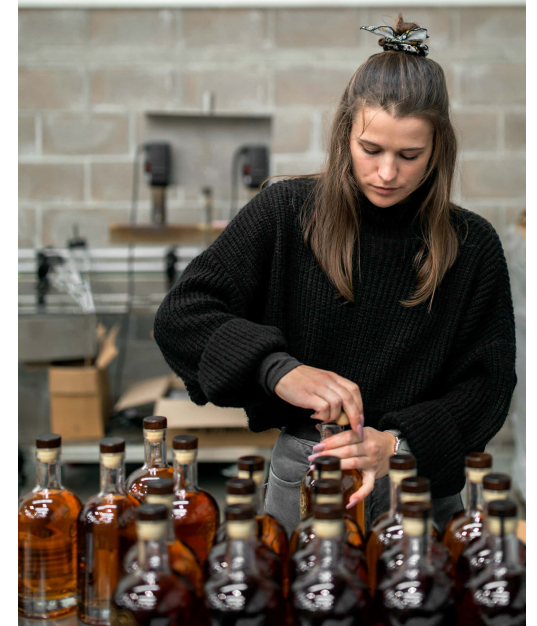
Sensory & Dilution:

Getting to know your spirits is a good thing. Try tasting as much as possible while you blend. Have a flavor wheel in front of you and take notes. If it's too strong, remember, you can still dilute your spirit from 'barrel proof.'



6. Blending & Bottling - Equipment Checklist

- Racking Cane or Spigot from Vessel
- 100-250ml Test Jar Cylinder Selection
- Spirit Tasting Glass
- Proof & Tralle Hydrometer
- Nylon or Muslin Mesh Bag
- #4 Coffee Filters
- Funnel
- Bottles
- Corks
- Wax
- Labels
- Bottle Brush



You may see some equipment turn up again in other processes.

6. Blending & Bottling – Process

Example: single run rum

Step-by-step

Take aged rum and pour through a #4 coffee filter mounted inside a funnel going to a new collection vessel to remove oak chips in spirit > sample spirit and cut to desired strength > determine if there is other rum ready to blend > if so, use 100ml test jar to blend 10 to 20mls at a time of spirits starting with 50/50 if this is your first attempt at blending these spirits > determine blend (or none) and consider dilution rate > take down to 40% ABV for typical rum > dilute batch > pour from collection vessel of diluted spirit into bottles through funnel (or use racking cane or spigot) > cork bottle > melt wax beads on stove in soup can, constantly stirring > dip neck in wax carefully > label bottle and enjoy!

Other Tips & Info

- Cut spirit to around 18% and add sugar and flavor until you're satisfied to make liqueurs.
- If you'd like to make gin, be sure your still can support a botanicals basket (and try maceration).
- If you'd like to make essential oils, be sure you have a still that can completely enclose botanicals.
- If you'd like to make ethanol fuel get yourself a column still.
- Learn and use the free online calculator tools! Spirit calculators for dilution and proofing are available.
- Check out 'How To Distill' the book for more detail, recipes and info. Also check out howtodistill.com – I'll continue to add information and recipes there as well!

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Distilling Workshop



Aaron Hyde
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