

## A comparison of Malt whisky production methods in Speyside and Islay regions within Scotland

Before setting out to Scotland I decided on a study subject that I thought would give me the opportunity to look at how the whisky industry has modernised in the past 20 years and evaluate the impact this had on the character of the final product. I imagined that the recent mergers in the industry, that have brought it to be dominated by corporate giants like Diageo and Pernod Ricard (together owners of 60% of Scotch whisky production<sup>1</sup>) would have led to adoption of more homogenous techniques and styles. I also imagined there would be debate around the adoption of computerised distillation as opposed to traditional manual control of stills. The opportunity to visit both Speyside and Islay meant I could contrast the impact on two very different styles of whisky, the fruity and floral characters of Spey malts as opposed to the wild, peaty characters of those from Islay. Upon my arrival I realised that this was not a simple question, although many distilleries had modernised to a certain extent, they still maintained many traditional aspects of production and these would vary by each distillery. To fully evaluate what created the identity of each malt became a complex puzzle, with the answer lying in the unique formula of techniques adopted by each distillery that make their house style. Therefore in this essay I will start by taking an overview of the modern techniques that have been adopted and the impacts these have made, but will also look more closely at what aspects of production create the individual style of the malts at each of the 11 distilleries I visited.

If you had to summarise how malt whisky is made, you can simply say you start by brewing a beer, then boil it in copper stills, collect the vapours and create a spirit that is aged in oak for at least 3 years. But the process is far more complex and lengthy than that sounds. The diagrams below help mark out the key stages:

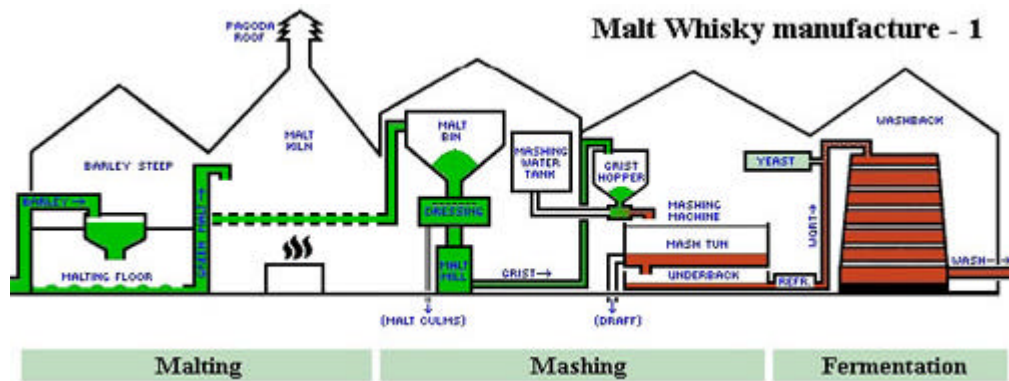
**Malting** – here you take the raw barley and steep it in water for 48 hours. Then the grain is laid out on malting floors for 5 days with warm air circulating. This tricks the grain into thinking it is spring, so it starts to germinate, roots and shoots grow and the raw starch begins to convert into sugar. At this point you dry the grain out in a kiln, if this fire contains a lot of peat, then you create the distinct smoky characters that are known in Islay whiskys.

**Milling & Mashing** – The grain is then ground to create a rough flour called “grist” that is placed in large mash tuns, filled with water that act like a giant tea bag to infuse the water with all the character of the grain. 3 waters are used at increasingly high temperatures. The resulting sugary sweet liquid called “wort” is drained.

**Fermentation** – The liquid is placed in large wooden or steel washbacks. At this point cultured yeast is added to start fermentation. After approximately 48 hours a 7-10% abv beer is created which tastes like a creamy, rich blonde style beer with sweet malty character.

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<sup>1</sup> [www.ForArgyll.com](http://www.ForArgyll.com) (accessed 20/02/10)

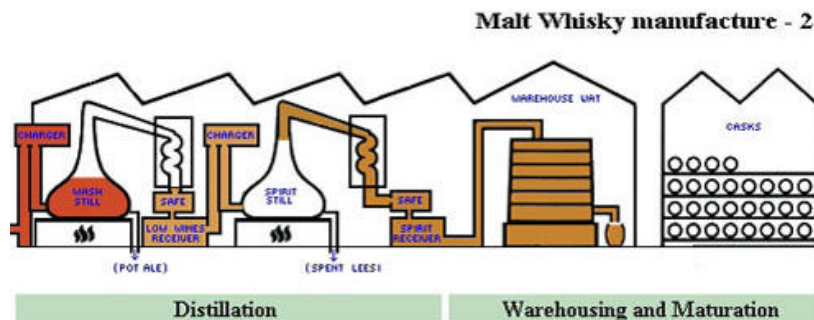


<sup>2</sup> Distill

**Distillation** – This beer is twice distilled, in copper pot stills, normally with a larger wash still for the first run, combined by a smaller spirits still for the second. The exact shape and size of these stills will vary between each distillery, which accounts in a large part to the character of the malt. The final condensed vapours from the second still are collected in a spirits safe. Not all of these are collected, the first vapours “foreshots” are too volatile and could be poisonous so are separated whilst the final vapours “feints” are too heavy and rough so they are also separated, only the “heart” or middle of the vapour run is desirable. These unwanted condensed vapours are then recycled into the next wash run. The exact “cut points” for taking off the “heart” dictates the style as much as the shape of the stills, since the flavour and aroma compounds that may be kept in with small proportions of the beginning and end of the spirit run can completely alter the style of the malt. At this point the spirit is called “new make” and is colourless with an abv of between 60-75%.

**Maturation** – The spirit is then aged in oak casks of less than 700 litre capacity. Dependent on the wood experts argue this can impart between 40-70% of the final character of the whisky<sup>3</sup>. Traditionally ex-sherry butts were used but since the 1950s the focus has been on ex-bourbon barrels. First the charred inners of these barrels act to soften and remove impurities then the spirit interacts with the wood extracting the rich flavours such as vanilla, spice & nut. Sherry casks have a richer fruity character whilst Bourbon imparts more vanilla and spice. They will also impart some of the colour to the final spirit.

**Blending & bottling** – A number of casks will be blended together to create consistent style before the addition of water to bring it to 40-46% abv. Then chill filtration and the addition of a small amount of caramel to colour will bring the spirit ready to bottle.



<sup>2</sup> [www.ibdasiapac.com.au/distilling/](http://www.ibdasiapac.com.au/distilling/) Diagram 1 & 2 (accessed 20/02/10)

<sup>3</sup> p18 Andrew Jefford “Peat Smoke & Spirit”

The basic steps taken above have remained the same over the decades, what has changed is level of automation at each stage and some of the methods. It was interesting to note how little had actually changed, there is still an air of superstition driven by a lack of understanding of what actually creates a given style. At each distillery I was told a different story, some thought it was their water, others their long ferments, distinct shape of their stills, cut points or type of oak casks. A good example of this inertia is the length that distilleries take to replace the shape and size of their stills once they become too old. Forsyths of Rothes, manufacturer of stills, will measure the original in 85-90 places in order to produce exact replicas.<sup>4</sup> There are even stories of distilleries that reproduce the dents from their old stills in order to maintain their style. Yet no-one is able to prove this makes a real difference to the final product.

So what has changed? By going through the steps in the whisky making process it is easier to evaluate where most modernisation has taken place.

Starting with the malting. Ian Williams at Cardhu distillery gave me a great overview to how this has changed. Maltings used to be on site, in warehouses where the malt was spread on the floor and turned regularly by hand (inducing a common injury "Monkey Shoulder"). Only a few distilleries now malt even part of their grain such as Balvenie, Laphroaig and microdistillery Kilchoman. The doors of warehouses would be open and closed to regulate temperature, which made it difficult to malt properly if the weather was too hot or cold during the year. Now almost all distilleries buy from commercial maltings with Diageo running the largest in Burghead, Roseline, Glenord and Port Ellen (Islay). These maltings have used mechanical salad boxes to turn the grain since 1960s and temperature control the activity. They will then kiln fire the malt and distilleries can specify the exact parts per million (ppm) of peat they would like in their malt. Also in recent decades almost all distilleries have converted to using Optic malt strains which proved to be the most efficient in the mashing process<sup>5</sup>. So the similarities in how malt is now made should create a more consistent product but at the same time may have reduced any interesting variations that had helped create distinct styles.

Similarly the changes in the mashing process have been largely due to modern equipment. The "Leuter" or "Semi-Leuter" Mash tuns are widely used in Speyside and Islay; a stainless steel tun with mechanical arms to slowly aerate and move the mash with an efficient draining system. The temperature of each water will vary slightly between distilleries but they will all gently raise the temperature from the 1<sup>st</sup> to 3<sup>rd</sup> water to extract the sugars. The traditional Strathisla tuns were simply less efficient and had to be manually cleaned between each cycle which was time consuming. Bunnahabhian on Islay is the exception to either of these methods since they have a unique set of huge 15,000l capacity tuns that are traditionally raked with 4 rather than 3 waters. However according to their distillery manager this has no impact on the character of the resulting wort. Therefore the conclusion would be that modern advances on the mashing system will have no impact on the styles of whisky being produced today.

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<sup>4</sup> p73 Andrew Jefford "Peat Smoke & Spirit"

<sup>5</sup> p100 Charles Maclean "Whisky Tales"

Fermentation is a subject that is much better understood nowadays and has made distinct advances in the past two decades. Cultured yeasts are now used instead of fresh brewer's yeast, mostly Quest or Mauri yeast strains which have been proved to be most viable. Whilst fresh yeasts may have added character they would also lose their viability when transported which was particularly problematic for distant locations like Islay<sup>6</sup>. The type of wash backs used to ferment do vary considerably between distilleries, many sites I visited are still using traditional Oregon Pine or Douglas Fir wood washbacks, such as Glenfiddich, Glenlivet, Caol Ila and Ardbeg. However modern stainless steel versions are now becoming more common and are used at Macallan & Laphroaig. Ewan Mackintosh from Caol Ila argued for the benefits of wooden wash backs as opposed to steel, he explained that Bowmore had converted back to wood because it has more rounded temperature control and also the bacteria in the wood consumes some of the alcohol whilst imparting some taste into the wash. But the aspect of fermentation that has the most influence on the character of whisky is the speed of fermentation. Short ferments produce a malty wash whilst long ferments are required to break down the phenolics in peaty worts like those from Islay and create a more acidic and complex style. Hence the fermentation at Macallan can be as short as 48 but at Caol Ila is from 80-110 hours. The length of ferment used at distilleries has not necessarily changed but the level of control is better, in past decades they may have just been left over a weekend to take place whereas now they are more closely measured. So modern advances have just gone to increase the consistency of each house malts style, rather than make them all the same.

As mentioned earlier, the shape and size of the stills has been carefully replicated at each distillery over the years. It is the computerisation of this aspect of production which has been the most dramatic change. If you now visit a distillery like Macallan or Glenlivet you see sophisticated computer systems which precisely control the entire process from mashing to distillation. The end consequence is that the entire plant can be run by 1-2 people rather than 6. But many distilleries has decided to not totally automate and still use manual control at the cut point stage using hydrometers to monitor and adjust at which point they cut each stage of the distillation. This was the common approach in Islay and also seen at Balvenie and Glenfiddich in Speyside. The supporters of full automation such as Dennis Malcolm, General Manager at Glen Grant, believed that individual still men in the past cut differently leading to a variance in quality. On the reverse Rob MacPherson at Balvenie and the still manager at Ardbeg argued that manual cuts enable you to create more balance and precision in the style of each malt, ultimately leading to a more characterful style. Since the level of peatiness in malts is dictated by the precise level of feints this is of greater importance in Islay. It must be taken into account that this is an emotive subject because the reduction in labour required to run a plant has consequences on many of the local families who rely on the trade for employment; in Islay many of these people now work on the tourist and hospitality side.

If you enter a specialist whisky shop or duty free today as opposed to 20 years ago the amount of styles of whisky available has dramatically increased. A good example is Briuchladdich distillery that has 59 different types available on the "Whisky exchange" online

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<sup>6</sup> p72 Andrew Jefford "Peat, Smoke & Spirit"

shop, variations are mainly down to age and finishing, using a range of cask types even those that had contained specific wines like a 1993 Italian "Sassiciaia"<sup>7</sup>. Almost every distillery I visited had adopted this approach mainly with different oak finishes like Macallan's "Fine Oak" or experimenting with peat levels like Ardbeg's "Supernova". But when you spoke to distillery managers most viewed this trend with distain, a marketing tool to appeal to enthusiasts. So it is perhaps more relevant to look at what has changed in the basic practices of single malt maturation.

Two main changes have occurred in maturation techniques since the Second World War. First the number of distilleries with cooperages on site have diminished and second the type of wood used to mature has swung in favour of ex-bourbon rather than sherry; now used for 95% of barrels<sup>8</sup>. Whilst visiting the on-site cooperage that supplies Glenfiddich and Balvenie with Rob MacPherson, the main benefit of having a dedicated supply appeared to be the ability to closely monitor quality standards. If cask is not rejuvenated with care then bacteria can get into the cask, creating off flavours in the spirit. The switch from ex-sherry to bourbon barrels has a more marked impact. Reasons for the change are price driven; Bert Mauer at Glenfiddich quoted that ex-sherry casks now cost £550 as opposed to £55 for bourbon. Prior to an EU ruling in 1983 sherry was transported in bulk and bottled in the UK providing a cheap local source of casks, but now that sherry consumption has diminished and casks need shipping the price has risen exponentially. Only two of the distilleries I visited Macallan and Bunnahabhian still use predominantly ex-sherry casks as a result. This will most definitely influence the character of the whisky. Ex-bourbon casks are made of American oak with charred inners. The carbon in this char acts as a purifier, softening the harsh edges of the spirit and the type of oak has high levels of vanillin flavours. In contrast ex-sherry casks are made of European wood and are toasted, so they don't have the carbon properties and the sherry imparts flavour characters closer to dried fruit and spices. So a widespread swing to using ex-bourbon would implicitly mean a lighter more vanilla dominated style. A final change to note is where the whisky is stored, on Islay it is becoming common to ship the spirit in tankers to the mainland for maturation, for example Ardbeg and Caol Ila distilleries transport most of their production to near Edinburgh. The distinct salty tang of Islay whiskys was commonly attributed to the proximity of their warehouses to the sea. Although this was never scientifically proven; at Bunnahabhian they tried storing Glenrothes Highland whisky in their warehouse to test the theory and found there was no identifiable impact.

Given the varied opinion on the impact of the modern advances detailed so far, it is difficult to reach a conclusion of how much the basic character of Scotch malts has changed in the last two decades. Starting with the early stages of malting, mashing and fermentation, I would say the new techniques have probably helped create a more consistent style in the product and if anything improved quality. In contrast it does seem that the level of automation of the distillation process may be a precursor so a more homogenous style of whisky and potentially retaining manual cut points is a good idea. The dominance of ex-bourbon barrels is another change that will have altered styles but sadly costs will prohibit widescale reversion to use of ex-sherry casks.

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<sup>7</sup> [www.thewhiskyexchange.com](http://www.thewhiskyexchange.com) (accessed 20/02/10)

<sup>8</sup> p149 Charles Maclean "Whisky Tales"

To complete the evaluation of the styles of malts I encountered at each distillery I visited it is necessary to take each one in turn and identify the unique aspect of their production which impacts their style. In Speyside I visited Glenfiddich, Cardhu, Macallan, Glen Grant & Balvenie then in Islay Laphroaig, Caol Ila, Ardbeg, Kilchoman and Bunnahabhian.

Starting with Glenfiddich where I was shown around by Bert Macor. The elements of their process that stood out was a relatively long ferment for a Spey malt of 66 hours which produces a fragrant and fruity wash evident in the final style of their whisky. Their stills are also small for the area, the wash still has a long tall neck and gently sloping arm providing a good area for copper contact and promoting reflux whilst the even smaller spirit still have a squatter "ball" shape which again creates added reflux and copper "conversation". Very little foreshots are taken off in their run which would contain the estery flavours and sharper alcohols. In maturation they use 60:40 of ex-bourbon and sherry from their on-site cooperage which is higher in sherry than industry standard. The purifying impact of extended copper contact comes through in the delicately balanced character of their malts, with subtle tannins, light floral and fruity characters and a flavour spectrum that includes the dried fruit, orange peel characters you would expect from the influence of sherry wood.

Master blended Ian Williams introduced me to Cardhu distillery which is one of the providers of Johnnie Walker blend and part of the Diageo group. Fermentation is even longer here with 70 hours at average, which they say creates a fruity yet light and fragrant style. The stills are much larger tall, high and with straight horizontal lyne arms which makes it difficult for vapours to cross over and therefore promotes a lot more reflux and thereby an elegant spirit. The final style is light and grainy with some expressive citrusy notes which make it a perfect blending partner for Johnnie Walker.

Macallan distillery likes to be known for its use of oak and dedicates a full warehouse of space as an exhibition to the importance of wood influence on their whisky. Until recently they used 100% ex-sherry but now have adopted up to 20% bourbon. They have also fully automated their site and are raising production levels from 6 million litres in 2008 to 8 million in 2009. Some critics have viewed these recent changes as a decline in focus on quality and increased focus on marketing; as well as cost saving. Their fermentation time is 48 hours which is relatively short and should create a simple fruity wash. The stills are among the smallest in the area with a sharp angled arm on the wash still and gentle sloping arm on the spirits. The small size of stills gives the spirit high contact with copper and should promote a purified spirit, however the sharp lyne arm of the wash still limits the amount of reflux. They cut at 71-2% abv with quite a short hearts run leading to lots of recycling which means you would not get a great deal of the estery or heavy flavours from the start or end of the run. This style of production promotes a clean and simple spirit which can then be heavily influenced at the maturation stage where the sherry oak influence comes into play. Macallan's malt style is therefore dominated by sherry oak flavours such as orange peel, dried fruits, caramel & clove spice.

Dennis Malcolm showed me Glen Grant distillery. This was a fully computerised distillery operated by 1 man. They also conduct short ferments of 48hrs and used efficient heat exchanger systems which allowed them to get the wash ready to distill in a short time. The unique aspect of their distillery were the spirits purifiers, an extra set of copper tubes held at

the base of the lyne arms to give the spirit added "conversation" and thereby produce a cleaner spirit. Each still also had its own spirit safe which is known as having a "balanced system" and should provide more quality control. The spirit is then aged in mostly first fill bourbon casks which means the wood will have a greater influence on the style imparting high vanillin into the whisky which is evident in the final malts tasted.

Balvenie, where I was shown around by Rob MacPherson is one of the few remaining sites with its own malting and cooperage. However their output at the malting is limited and only makes up 8% of the total they use, with the rest coming from commercial malting. Fermentation is approximately 68 hours which is longer than most other Speyside distilleries and may partly account for the richness and complexity in their spirit. But it is their stills that probably have the biggest influence, the wash and spirit still are the same size with a tall neck, bulb at the base and low angle lyne arm, all of which promote reflux and prevent heavy esters from passing over. It is not a balanced system and cuts are made manually, which leads to variation in spirit strengths and adds character to the final product. Their cooperage is impressive, with strict quality control and careful rejuvenation methods for re-used sherry casks. In maturation they use 80:20 bourbon to sherry and for "Balvenie new wood" they finish the last six months in new wood to boost vanilla flavours. The flavours of Balvenie signature are an intricate mix of orange peel, honey, dried fruit with mellow spice and a biscuity length. It tastes hand crafted which well reflects the care that is taken in the processes they use.

Glenlivet is a modern site with only 2 men operating the entire process. It has doubled its production in recent years from 6 – 12 million bottles and is building new tuns, wash backs and stills to manage this increase. The level of peating of their malt is slightly higher here with 3-4ppm rather than 2-3ppm average at most Speyside distilleries. Fermentation is short at 46 hours and the wash smelt sweet and appley rather than the more horlicky aromas which were common at other Speyside distilleries. The washbacks are wood which will help produce a lighter more acidic wash and the short ferment would also account for the estery style. The wash still is very large at 15,000 litres capacity with a tall neck and steep lyne arm incline which means the heavy alcohols can reach over fairly easily. But then the spirits still is much smaller and has a horizontal lyne arm which means there is a lot of reflux and copper contact in this still and most of the purification of the spirit takes place at this stage. Glenlivet has always focused on ex-bourbon barrels for ageing their spirit, currently 98% ex bourbon of which most are first or second fill. The delicate style of Glenlivet with its baked apple, lemon, vanilla and gentle smokey flavours can for a large part be attributed to the purifying influence of the charred inner barrels and high vanillin influence of the early fills.

And then to Islay, where the character of both the malts and distilleries is dramatically different. There is the occasional flashy modern distilleries such as LVMH's Ardbeg, with its own bistro style cafe on site, but most retain a more traditional feel. The major difference from Spey malts is the impact of peat on their styles which makes for a smokey and powerful drink.

Laphroaig is one of the few sites that still malts 15% of its barley on site. It malts to 50ppm and also hand cuts its peat from a specific site near the Machrie hotel which they say is

more potent than others. Its wash backs were converted to steel in 1985 and its wash smells more grainy than those in Speyside, tasting of bitter grapefruit, the ferment is short for Islay at 55hrs. The whole site is computerised with just 1 man monitoring the process, which is also unusual for Islay. Wash and spirits still differ with a medium sized wash still (10,500 litres) that has a tall lamp glass style neck and lyne arm that slopes upwards. The spirits still is half the size (4,700 litres) with a similar lyne arm. In 1972 an additional double sized spirits still was added and this has been noted to have changed the house style<sup>9</sup>. The style of lyne arms promotes additional reflux and is rare in distilleries. The foreshot run is one of the longest in the industry at 45 minutes which will remove and recycle heavy alcohols, plus avoid the sweet estery characters found in this part of the run. The cuts are broad with feints starting at 60% abv. Laphroaig is considered to have a unique boisterous smokey style, many account for its unique still shape and cuts as the reason for its pure smoke laden character. In maturation it uses purely ex-Makers Mark Bourbon barrels only first fills with grade 3 charring which is high and will help purify the spirit from its carbon content.

Ardbeg buys all its malt from Port Ellen at 46ppm. Since it was bought by LVMH it has modernised installing stainless steel tuns, but retaining traditional Oregon pine washbacks and still manually monitoring the process with 3 men on site. The fermentation is also relatively short for Islay at 52 hours. It shares the lamp glass style still and gentle upward sloping lyne arms with Laphroaig. However the spirit and wash still are the same height, differing only by their shape; wash still with a long straight neck and spirits still a bulb squat base with thinner middle to promote copper contact. Uniquely for Islay, it has an extra spirits purifier on top of the still. Unlike Laphroaig it has a short foreshot run of 10 minutes leaving more sweet, estery characters in the final spirit. So despite the similarities to Laphroaig, its spirit is very different with a more elegant smoke influence and grassy lemon character. At least 90% of casks used are ex-bourbon, mostly from Jack Daniels. Most warehousing is off site on Edinburgh mainland, limiting the impact of the sea air on the ageing process which is said to give some Islay whiskys a seaweed influence.

Visiting Kilchoman is a unique experience, this microdistillery was set up in 2005 and is based on a farm that has set up the site so that they can conduct the entire process from growing the barley through to ageing. Production is only 90,000 litres a year which is close to what Caol Ila produces in a week. Unfortunately their first malt will not be released until next year so only "new make" is available to judge how their house style may develop. Touring the distillery you can see that utmost care is taken at every stage of the process. They malt their barley between 35-40ppm lower than the average 50ppm at Port Ellen malting. The wash is fermented between 50-55hrs, given the lower peat levels in their wash less time is required to convert the phenols in this process. The stills are sparkling new and tiny compared to any other distillery, with only 3,230 litre capacity in the wash still and 2,070 litre in the spirits. This means there is increased surface area contact of the spirit with copper, promoting an ultra pure spirit. To reflect this they only run foreshots for 5 minutes because the spirit is already quite clean, they cut at a relatively high 65.5%abv which means they will collect the heavier more phenol influenced ends of the run. Ageing is

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<sup>9</sup> p333 Andrew Jefford "Peat, Smoke & Spirit"

80% in "Buffalo Trace" ex-bourbon barrels with a maximum of second fills used. The "new make" showed real promise with its delicate smoke, light cereal and lively citrus flavours; a complex array of characters which reflects a hand crafted style.

Caol Ila is perhaps the most picturesque of Islay distilleries housed in a remote part of the island, its glass fronted still room overlooking the sea with the "Paps of Jura" mountains in the background. A traditional distillery, with none of the automation found in Speyside, its malt is peated to 35ppm which is the same as Lagavulin yet its spirit is renowned for a far more elegant, gentle smokey style. The reason for this is twofold. First the fermentation is run at low temperatures for 80-110 hours which is double that of the likes of Laphroaig, allowing complex congeners to develop in the wash. Second the wash and spirits stills are extremely large both at approximately 20,000 litres but they are only half filled which means there is good opportunity for copper "conversation" and reflux, encourage by gently sloping lyne arms. Cut points are also narrow which means the more boisterous smokey characters on the feints are not collected, the hearts collector is wood which is said to give a waxy influence to the spirit. So the result is the most elegant of Islay malts, with zesty lemon, waxy vanilla and pure smokey ash character, with hints of iodine on the nose. Maturation takes place on the mainland in second or third fill ex-bourbon barrels, thereby having limited impact on the final flavour.

A trip to Bunnahabhian is an adventure in itself, even more remote in location than Caol Ila, at the end of a cliff top winding road with a site hanging precipitously next to the sea. It is also the most traditional in set up, entirely manual and using some unique techniques in its production. It has giant mash tuns holding double the capacity of Lauter tuns at 15,000 litres and using vertical paddles that extract the sugars aggressively. The ferments are long at 110 hours and this is the only Islay distillery to have 0ppm in their malts. It has large onion shaped wash stills holding 16,500 litres and smaller pear shaped spirits stills both with low angled lyne arms. They only part fill them which helps promote additional reflux, similarly to Caol Ila. Cut points are narrow which prevent the early estery and late oily characters coming into the spirit. The maturation is again unique with 90% refill sherry butts in use which can be used up to 4 to 5 times but are reconditioned. They stated that 70% of their flavour comes from maturation and this makes sense because the distillation process aims to produce a clean, pure tasting spirit. The resulting malt is deliciously rich with candied orange peel, mocha, raisin and rum characters.

As an overall conclusion to this study, it is difficult to make any sweeping generalisations about Malt whisky production techniques because they vary in so many aspects between regions and distilleries. But if you look at the level of impact modernisation has had on styles of malts it is limited. The automated processes used for malting, fermentation and distillation create consistency in product without necessarily a homogenous style because individual distilleries are still using a variety of methods in other aspects of their production that enable them to retain a house style. The increased efficiency in mashing allows improved throughput and profitability without any impact on quality or style. The only topic that is inconclusive is automated cut points because so many quality distilleries are retaining a level of manual control even though there is no scientific reason to say this would improve the product. The change that will have had the greatest impact is the movement from ex-

sherry to bourbon barrels which isn't strictly down to modernisation but more due to economics. Given the level of impact wood types have on the final taste of malts this will mean an overall movement to more vanilla and spice influenced bourbon styles.

When looking more closely at each distillery and what has created their "house" styles it becomes clearer that there is a distinct split between Speyside and Islay techniques as well as the taste in these whiskys. Spey distilleries have spirits that are mainly influenced by the shape and size of their stills, whether they promote "conversation" or "reflux" and thereby the level of purity in the spirit. Then also the level of ex-sherry oak used in their maturation, which is high in many Spey distilleries like Macallan or Glenfiddich whereas it is rare in Islay. In contrast the influence of peat in Islay whiskys means the "house" style is created differently. The influence of still shape and size is still important but the level of peat character is also controlled by fermentation lengths and the width of cut points. Maturation is more consistent in Islay since all distilleries but Bunnabhian use ex-bourbon barrels. However within these broad generalisations they are many more differences between each distillery's techniques, often shrouded in mystery, that enable them to keep creating unique products. Without these differences the malt whisky world would become a less interesting field and this is what continues to attract the passion and enthusiasm from its followers.

## Appendix

### Balvenie Distillery - Malting Floors



### Glen Grant Distillery – inside a Leuter Mash Tun



**Laphroaig Distillery – Fermenting wash**



**Glenfiddich Distillery – Still Room**



**Cardhu Distillery – Still Room**



**Ardbeg Distillery – Spirits Safe**

