Achieving Better Quality in Distilling Operations

In addition to the videos in the Distillery Operations course about quality and process control, the following is a guide that's intended as a download for refresher reading for students, or to use to inform others ahead of a team meeting.

It is designed to help distillers and spirits brand owners understand, plan, control, and improve the quality of their distilling operations. This four-part guide covers all the important aspects of quality management in distilling, from understanding what quality means and how to achieve it, to practical methods for controlling and continuously improving quality in your production process.

The document is divided into four parts:

- **Part 1: Understanding Quality** – We start by defining what quality means in distilling and why it's important.
- **Part 2: Quality Planning** – This section covers how to plan for quality, focusing on understanding customer needs (Voice of the Customer) and translating those needs into specific production requirements (Critical to Quality attributes).
- **Part 3: Quality Control** – Here, we explain how to monitor and control quality during production. We discuss tools like Statistical Process Control (SPC) and how to handle any issues that arise.
- **Part 4: Quality Improvement** – This final section looks at how to make your distilling process even better over time. Quality improvement is an ongoing effort, and we explore methodologies like Six Sigma and Root Cause Analysis to tackle problems effectively and achieve higher quality standards.

This guide aims to make quality management approachable and practical, providing you with the knowledge and tools you need to produce consistently high-quality spirits that your customers will love.

Part 1: Understanding Quality

Quality might sound complicated, but it really just means making sure your product is good enough to meet your customers' needs.

When we talk about quality in distilling, we mean that the spirit (whether it's whisky, rum, or gin) meets the expectations of the people who buy it. This could mean the right smoothness, a specific flavour profile, or even how it's packaged. Quality is about making a product that people love and want to buy again.

There are two main parts to quality:

1. **Right features**: This means your product has all the attributes that customers care about, like flavour, aroma, packaging, or mouthfeel. For example, a gin might need to have a strong botanical aroma, while a whisky could need a smooth, balanced finish.

2. **Freedom from deficiencies**: This means the product should be free from flaws, like strange flavours or impurities. Every bottle should be consistent—no surprises or mistakes that would make the customer unhappy.

Defining quality: Different perspectives

To understand quality better, we need to look at it from different angles. Some people think of quality as just meeting specifications—like making sure the alcohol content of a gin is exactly 40% ABV. But quality is more than just numbers. It's about the overall experience. Philip Crosby said quality means sticking to requirements, while Dr. Joseph M. Juran said it's about "fitness for use". In other words, making sure the product is good for what people want to use it for.

Juran's idea focuses on having the right features and no flaws. It's not just about technical aspects like alcohol content or exact time in cask; it's also about whether your customers enjoy drinking it, whether it tastes right, and whether the packaging catches their eye. This broader view is especially important for craft distillers, where every detail matters to tell a story and create a unique experience.

Variation is one of the biggest challenges in maintaining quality. Your spirits should be the same whether you make them on a Monday or a Friday, and whether they're tasted in Scotland or the United States. Variation can come from changes in ingredients, differences between operators, or even small equipment issues. To reduce this variation, you need strong processes and careful monitoring of key steps. Reducing variation makes your product more reliable, which will help with customer retention.

Quality and the bottom line

Quality impacts profits in a big way. When you make a high-quality product, customers are willing to pay more, and they're more likely to buy from you again. On the other hand, low-quality products can lead to problems like customer returns, bad reviews, or even product recalls. Imagine if an aged brandy develops a sulfuric smell during aging because the cask wasn't properly prepared. You might have to blend that eau de vie with something else to fix the issue, or spend money on extra filtering, which costs both time and money. You may need to simply dispose of it all together.

High quality helps boost revenue and lowers costs, improving overall profitability.

The Cost of Poor Quality includes things like rework, returns, and wasted resources. If quality isn't managed well from the beginning, it can lead to significant costs down the line. "Quality at the Source" means focusing on quality at every step of production—not just at the end. This way, you catch issues early when they're easier and cheaper to fix.

For example, if your supplier provides high-quality botanicals that meet all standards, you'll be less likely to have flavour issues later on.

Part 2: Quality Planning

Quality starts with planning before you even begin production. The first step is to listen to the Voice of the Customer (VOC) — this means understanding what your customers want and expect. If you're making a high-end whisky, customers might want a rich and complex flavour, while customers for a craft gin might be looking for fresh, unique botanicals.

After understanding these needs, you translate them into Critical to Quality (CTQ) requirements. These are the specific features that are essential to making your product meet customer expectations. This could include things like the specific alcohol content, flavour profile, or even whether the ingredients are sustainably sourced.

Let's break that down one more time to explain it further...

Voice of the Customer (VOC) and Quality Planning

VOC is important because it defines quality from the customer's point of view. It helps you figure out what's important to your customers and then make sure you design your product around those things. VOC can be gathered in many ways - for example via surveys, focus groups, or simply talking to customers directly.

Once you gather this information, you translate it into CTQs that guide how you produce your spirits. Quality Function Deployment is a tool that helps with this by turning customer needs into technical requirements at every stage - from raw materials to the final product. Quality Function Deployment prevents issues that can happen when different parts of your business work separately without clear communication.

To avoid quality problems, use tools like Design FMEA (Failure Modes and Effects Analysis). This helps you find possible problems before production starts. It's cheaper and less risky to fix issues before production compared to dealing with them afterward. Design FMEA involves thinking about all the ways a process could go wrong, how serious each issue would be, how likely it is to happen, and how hard it would be to detect—then taking steps to fix the most critical potential problems.

Quality by design and error-proofing

Design for Six Sigma is about building quality into the product right from the start. Instead of inspecting for quality at the end, you design the product to meet customer needs from the very beginning. DMADV (Define, Measure, Analyse, Design, Verify) is a process that helps you make sure everything is designed correctly to meet customer expectations.

Lots of acronyms and terms, but it's worth understanding them and becoming comfortable with the jargon! It'll be your turn to implement all of this soon...

Another important concept is error-proofing. This means designing your processes to prevent mistakes or make them obvious right away. For example, you could set up automated cut-off points in the distillation process to stop unwanted distillates from getting into the final product or use sensors to automatically check temperature levels during production.

Part 3: Quality Control

Quality Control is about making sure that the quality you planned for is actually achieved during production. It involves monitoring the production process and catching any problems early.

The QC process includes:

1. **Identifying key control points**: This means figuring out the most important points to monitor, like fermentation temperatures or collecting the distillate at the right time (making the cuts). These control points might also include checking the health and viability of yeast or ensuring all ingredients are as expected through raw material intake protocols.

2. **Measuring and monitoring**: Tools like Statistical Process Control (SPC) help you track important measurements and keep everything within acceptable limits. For example, you might track the temperature and time during distillation to make sure each batch is consistent. SPC charts help determine whether variations are normal or if something has gone wrong that needs to be corrected.

3. **Taking corrective action**: If something goes wrong, corrective action is needed. For example, if a batch doesn't taste right, you might need to adjust the botanical mix or modify the distillation temperatures. The goal is to correct the issue before it affects too much of the product.

Quality metrics and tools

Quality metrics are ways to measure how well you're doing. These could be things like the percentage of defective bottles, yields, or customer satisfaction scores. These are known as lagging indicators because they tell you what has already happened. But effective quality management also uses leading indicators, like raw material quality or fermentation consistency, to predict and prevent problems.

Process Capability (Cp, Cpk) metrics tell you how well your process can meet the required specifications.

Cp measures the potential capability of a process by comparing the range of specification limits to the spread of the process data, while Cpk accounts for how centred the process is within those limits. A high Cp and Cpk value means your process is capable of consistently producing within specifications, with minimal variation.

If your process is capable, you're more likely to produce products that consistently meet customer expectations, leading to fewer defects and more satisfied customers.

Quality at the source

Instead of just checking quality at the end, quality at the source focuses on making sure quality is maintained throughout the entire process. This means training operators to do their own checks and empowering them to stop production if they notice something wrong. This is similar to the Toyota production system, where workers can stop the production line if they see a defect.

Part 4: Quality Improvement

Improving quality is a constant process. Even if your product meets standards today, there are always ways to make it better. Quality improvement is often done through targeted projects.

Six Sigma DMAIC (Define, Measure, Analyse, Improve, Control) is a method used to tackle quality problems and set out the scope of an improvement project:

1. **Define**: Define what the problem is—like customers saying the flavour isn't as good as before.
2. **Measure**: Gather data on everything related to the problem—such as botanical types, fermentation times, or distillation temperatures.
3. **Analyse**: Figure out the root cause of the issue. Maybe a new supplier's ingredient isn't up to par, or an equipment setting is off.
4. **Improve**: Make changes to fix the problem. This could mean changing the ingredient supplier, adjusting the timing, or retraining staff.
5. **Control**: Put measures in place to make sure the improvements stick. Regular monitoring and adjustments help maintain quality.

Root cause analysis and tools for improvement

Root Cause Analysis tools like the '5 Whys', Pareto Charts, and Fishbone Diagrams help you figure out what's really causing problems. These tools help you dig deep to understand what's going wrong and find the best ways to solve the issues.

Quality improvement should be done project by project to make sure you're focused and effective. Dr. Joseph Juran famously said, "All improvements happen project-by-

project and in no other way." This means focusing on one specific area at a time, like fermentation or packaging, and making deliberate improvements to see real results.

Error-proofing and statistical tools for quality improvement

Error-proofing helps stop mistakes before they happen. For example, using automatic batch records or safety systems can prevent operators from adding the wrong ingredients. It's always better to prevent mistakes than to correct them later.

Statistical Process Control (SPC) is another useful tool for improving quality over time. It helps you see trends and variations in your process so you can catch problems before they become big issues. The goal is to keep your process stable and predictable.

Final thoughts for you to work with...

Quality in distilling is about more than just making a tasty product. It involves careful planning, monitoring, and continuous improvement. By understanding what quality means to your customers, planning your processes well, controlling every step, and always looking for ways to improve, you can make sure your spirits are consistently great and valued by those who drink them.

Quality isn't something you achieve once and then forget about either.

It's a journey. Every batch, every barrel, and every bottling run gives you the chance to do better. Build quality into every step - from designing your recipe to distillation, to bottling, and even branding - and you'll be able to meet and exceed the expectations of spirits enthusiasts around the world.

If you stay committed to continuous improvement, your products will not only meet quality standards but become favourites for years to come. So, use the information in this document as the start point to have a team discussion. The videos in the course will also cover similar ground and re-enforce the learning it in different ways. Target a few key areas and establish what kinds of tools, systems and metrics you want to (and should) improve.

Then take it one project at a time!