CHUKWUANI OLUCHI FAVOUR

16/SCI05/002

MCB 406

MICROBIOLOGICAL QUALITY ASSURANCE

Quality assurance (QA) is a way of preventing mistakes and defects in manufactured products and avoiding problems when delivering products or services to customers; which [ISO 9000](https://en.wikipedia.org/wiki/ISO_9000) defines as "part of [quality management](https://en.wikipedia.org/wiki/Quality_management) focused on providing confidence that quality requirements will be fulfilled". This defect prevention in quality assurance differs subtly from defect detection and rejection in [quality control](https://en.wikipedia.org/wiki/Quality_control) and has been referred to as a shift left since it focuses on quality earlier in the process (i.e., to the left of a linear process diagram reading left to right)(Larry,2001)

The terms "quality assurance" and "quality control" are often used interchangeably to refer to ways of ensuring the quality of a service or product. For instance, the term "assurance" is often used as follows: Implementation of inspection and structured testing as a measure of quality assurance in a television set software project at Philips Semiconductors is described. The term "control", however, is used to describe the fifth phase of the Define, Measure, Analyze, Improve, Control (DMAIC) model. DMAIC is a data-driven quality strategy used to improve processes.

Quality assurance comprises administrative and procedural activities implemented in a [quality system](https://en.wikipedia.org/wiki/Quality_system) so that requirements and goals for a product, service or activity will be fulfilled. It is the systematic measurement, comparison with a standard, monitoring of processes and an associated feedback loop that confers error prevention. This can be contrasted with [quality control](https://en.wikipedia.org/wiki/Quality_control), which is focused on process output.

Quality assurance includes two principles: "Fit for purpose" (the product should be suitable for the intended purpose); and "right first time" (mistakes should be eliminated). QA includes management of the [quality](https://en.wikipedia.org/wiki/Quality_%28business%29) of raw materials, assemblies, products and components, services related to production, and [management](https://en.wikipedia.org/wiki/Management), production and [inspection](https://en.wikipedia.org/wiki/Inspection) processes (Stebbing, 1993) The two principles also manifest before the background of developing (engineering) a novel technical product: The task of engineering is to make it work once, while the task of quality assurance is to make it work all the time ( Prause *et al.,* 2016)

There are several steps in the brewing process, which may include;

* Malting
* Mashing
* Lautering
* Boiling
* Fermenting
* Conditioning
* Filtering
* Packaging

Malting is the process where barley grain is made ready for brewing.

 Mashing converts the starches released during the malting stage into sugars that can be fermented. The milled grain is mixed with hot water in a large vessel known as a mash tun.

Lautering is the separation of the wort (the liquid containing the sugar extracted during mashing) from the grains (Yiu et al., 2004)

 The boiling process serves to terminate enzymatic processes, precipitate proteins, isomerize hop resins, and concentrate and sterilize the wort. Hops add flavour, aroma and bitterness to the beer. At the end of the boil, the hopped wort settles to clarify in a vessel called a "whirlpool", where the more solid particles in the wort are separated out (Hornsey, 2004)

Fermentation takes place in fermentation vessels which come in various forms, from enormous cylindroconical vessels, through open stone vessels, to wooden vats. After the wort is cooled and aerated usually with sterile air yeast is added to it, and it begins to ferment. It is during this stage that sugars won from the malt are converted into alcohol and carbon dioxide, and the product can be called beer for the first time.

After an initial or primary fermentation, beer is *conditioned*, matured or aged, in one of several ways, which can take from 2 to 4 weeks, several months, or several years, depending on the brewer's intention for the beer

Filtering the beer stabilizes the flavour, and gives beer its polished shine and brilliance. Not all beer is filtered

THE TOP THREE ESSENTIAL QUALITY CONTROL MEASURES NEEDED FOR EVERY BREWERY

1. High quality basic instrumentation to monitor the brewing proces

Most brewers use simple hydrometers, because they are fast and esay. I would recommend taking it a step further and opting for a handheld digital density meter. These are far more accurate, and can correct for tempareture and alcohol present in the sample. Density meters take a little more work to maintain, but they will provide you with more precision when it comes to monitoring gravity during fermentation. These days neaarly every brewery lab is also using spectrophotometers are quite inexpensive and can allow a brewer to perform basic analysis such as wort color and bitterness units to more complex analysis like free amino nitrogen.

1. Good sensory program

A good sensory program does not necessarily rely on specific equipment, but it is very important to evaluate your beer in order to identify any quality issues prior to releasing. The focus should be on good and clean glassware, a dedicated room to perform the sensory, and a well- trained team to evaluate your samples. There are several software programs and even phone apps now, that help you track and trend your sensory results. These are amazing tools that will enable you to visually analyze any flavor or aroma deviations.

1. Proper methods

With anything that is done in the brewery, you can have the highest end equipment but never achieve good rsults without proper methods. Standard methods are the backbone of quality control. The most widely used industry methods come from the American Society of Brewing Chemists (ASBC) and the European Brewing Convention. These are both great resources in instrument usage and standard methods. ASBC also offers a check program, which allows breweries to perform analysis of varying methods using sample kits sent to multiple breweries performing the same analysis. It verifys the consistency of the procedure as well as technical proficiency by the individual brewery. This is a valuable opportunity of any brewery to evaluate their interpretation and performan ce of the standard method.

Test for Classic Biochemical Methods

Classical reagents, kit systems or convenient discs and strips can be used in the identification and confirmation of microorganisms. Based on rapid screening methods like the detection of enzymes with chromogenic substrates, indicators, or on complex building reactions, they are faster and easy to use. Also, the sensutivity to certain inhibitory substances can be used to identify organisms.

* Biochemical disc and strip tests
* Biochemical reagents

Test kits for innovative molecular biological methods

HybriScan rapid test kits are based on Rrna sandwich hybridization system which is less expensive and more robust than PCR methods. They are also more accurate (only detects living cells), quicker (time savings of up to 10 days over cultivation-based assays), and can be performed with standard laboratory equipment. These kits can be used for the identification and quantification of spoilage and pathogenic microorganisms in beweries. They are ideal for the comprehensive and reliable routine conrol of raw materials and concentrates in all production steps, up to the quality check of finished goods.

FUNCTION OF A MICROBIOLOGIST IN A BREWERY

A microbiologist will spend most of their time in a laboratory setting, analysing and identifying microbes found in the facility’s beverages against a database of known microbes. Their primary role is to ensure that there are no unsafe microbes being introduced during the beverage production process. It is a crucial quality control role that must be performed well to ensure the beverages produced are safe for public consumption.

A drinks industry microbiologist usually reports directly to a senior member of the quality control team. The microbiologist is also responsible for providing food safety and regulatory compliance advice to the production team of the facility.

**Key Responsibilities of the Drinks Industry Microbiologist**

Their key responsibilities include:

* Organise the ongoing operation of microbiological facilities

A drinks industry microbiologist must ensure that the laboratory has the equipment and supplies necessary to perform its role. They must organise and schedule the scientific analysis of incoming samples so the laboratory is productive and efficient.

* Provide advice to other departments within the facility

The microbiologist must be available to provide detailed food safety advice to other departments within the facility. They must be able to give them straightforward and practical advice for avoiding contamination of the facility’s products during production, bottling or transportation.

* Provide advice on plant hygiene

Maintaining a high level of hygiene is crucial for avoiding product contamination. The drinks industry microbiologist must be aware of common sources of contamination resulting from poor hygiene. They should share their knowledge with other departments throughout the facility.

* Ensure that the facility complies with regulatory requirements

The microbiologist must ensure that the facility’s Hazard Analysis and Critical Control Points systems meet regulatory requirements.

* Monitor water management systems

The microbiologist must ensure that the water coming into the system is of the highest quality and that it is correctly handled once inside the facility. They will ensure the water management system meets regulatory requirements.

* Support business development by providing information to stakeholders

They will help the business deal with partners by providing scientific and regulatory compliance information.

* Support product development and facility upgrades

The microbiologist will provide information to assist in the development of new products and expansion of the beverage-making facility.

* Help the beverage facility meet standards accreditation

They will help the facility achieve various forms of safety, environmental and food safety standards accreditation.

REFERENCES

Hornsey (2004). A History of Beer and Brewing (1st ed.). Washington D.C.: Royal Society of Chemistry.

Larry, Smith (2001). "Shift-Left Testing".

Prause, C., Bibus, M., Dietrich, C., and Jobi, W (2016). "Software Product Assurance at the German Space Agency". *Journal of Software: Evolution and Process*. **28** (9): 744–761.

Stebbing, L. (1993). Quality Assurance: The Route to Efficiency and Competitiveness (3rd edition). Prentice Hall. p. 300.

Yiu, H., Hui, J., and Scott, S (2004). Food Processing: Principles and Applications. Wiley-Blackwell.