Maltsters' Association of Great Britain

TACCP/VACCP

A Guidance Document for the Malting Industry

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TACCP/VACCP: A GUIDANCE DOCUMENT FOR THE MALTING INDUSTRY

Contents

1. Introduction

This document has been written, at the request of MAGB member companies, by a work group drawn from a number of UK malting companies.

The malting industry views the safety of its products as its primary concern. As such the industry has collaborated to develop food safety management systems that have greatly reduced the risk of a major food safety issue. These systems are underpinned by the MAGB Hazard Analysis Critical Control Point (HACCP) Protocol.

However, HACCP principles have not been routinely used to detect or mitigate against a deliberate attack on the whole supply chain. Threat Analysis Critical Control Point (TACCP) and Vulnerability Assessment and Critical Control Point (VACCP) are methodologies that align with the principles of HACCP but specifically look at the threats and vulnerabilities posed to a business. The principles behind TACCP and VACCP are therefore not new or significantly different from HACCP. However, the scope of both TACCP and VACCP are different from HACCP and therefore guidance is useful in how to implement both systems.

This document is intended as a guide to provide a route map for implementing both the Threat Assessment and Critical Control Point and Vulnerability Assessment and Critical Control Point risk management methodologies. It is not intended that this guide is used by an organisation as a TACCP or VACCP protocol but it highlights the processes and steps required to create one.

1.1. What are the aims of TACCP and VACCP?

Both TACCP and VACCP use the same risk management approach but there are subtle differences between the two.

Threat assessment and Critical Control Point (TACCP) helps food producers identify weak points in their supply chain and processing activities that maybe open to intentional and malicious attack. The TACCP protocol focuses on tampering, intentional adulteration of food and food defence.

Vulnerability Assessment and Critical Control Point (VACCP) focuses on food fraud as well but widens the scope to include the systematic prevention of any potential adulteration of food, whether intentional or not, by identifying the vulnerable points in the supply chain. VACCP is especially concerned with economically motivated adulteration. Examples of supply chain risks include product substitutions, unapproved product enhancements, counterfeiting and stolen goods.

If employed correctly both TACCP and VACCP help a business to minimise the chances of such an attack or to reduce the damage if an attack should occur.

TACCP and VACCP are employed by food businesses as part of a systematic approach to risk management to address the issues of malicious attack and food adulteration / fraud which will compromise food safety and product integrity. TACCP/VACCP should be used as part of a broader risk management process or as a way of starting to assess risks via a systematic approach. TACCP/VACCP, if employed correctly, can help an organisation:

1. Reduce the likelihood of a deliberate malicious attack
2. If an attack occurs reduce the impact on a business of that attack

3. Protect an organisations reputation
4. Reassure customers that the organisation is managing appropriately the risks in the supply chain and demonstrate due diligence
5. Demonstrate that reasonable precautions are in place to protect the supply chain

It should be highlighted that TACCP/VACCP in itself cannot prevent an attack on an organisation. However, if conducted correctly the use of TACCP/VACCP can reduce the likelihood of an attack occurring or reduce the severity of an attack if one should occur.

1.2. How does TACCP/VACCP Compare to HACCP?

It could be considered that the TACCP/VACCP process builds upon a business's existing HACCP as many precautions taken to protect the food safety of malt are also likely to deter deliberate malicious attack or frauds. Threat and vulnerability assessments look to document, deter, control, contain and mitigate against deliberate actions rather than the accidental or unintentional ones that HACCP addresses.

TACCP/VACCP is a risk management methodology which aligns with HACCP but has a different focus. Whereas HACCP focuses on the impact of the process on the food safety of a product as it is manufactured TACCP/VACCP considers the threats and vulnerabilities to a product within the entire supply chain. The focus of TACCP/VACCP could therefore be deemed broader than HACCP.

Where HACCP deals with pre-requisite programmes and critical control points TACCP/VACCP has response levels (typically **NORMAL**, **HEIGHTENED** and **EXCEPTIONAL**) which highlights the criticality of the threat.

1.3. Considerations When Conducting Your TACCP /VACCP

Because of the similarity of approach TACCP and VACCP studies could be run concurrently. However, it is essential that to be effective at implementing a TACCP/VACCP protocol there needs to be a systematic approach to the process. The TACCP/VACCP process seeks to provide answers to four key questions which are:

1. **Who might want to attack your business**
2. **How might they do it?**
3. **Where is the business vulnerable?**
4. **How can the business stop an attack?**

In essence it is the role of the TACCP/VACCP team to get into the mind of a potential attacker and identify the weaknesses within their own business. Having identified those weaknesses it is necessary to identify how those weaknesses could be exploited and therefore the measures that need to be employed to ensure that they can be protected.

By this logical approach the business will have confidence that all relevant elements have been considered.

2. Starting a TACCP/VACCP Study

TACCP/VACCP requires a logical and systematic approach. Therefore a TACCP/VACCP study sequence or route diagram can provide an appropriate framework for the assessment.

The route diagram highlights the key areas that need to be considered and ensures that elements of the process are not forgotten. The route diagram is illustrated below:

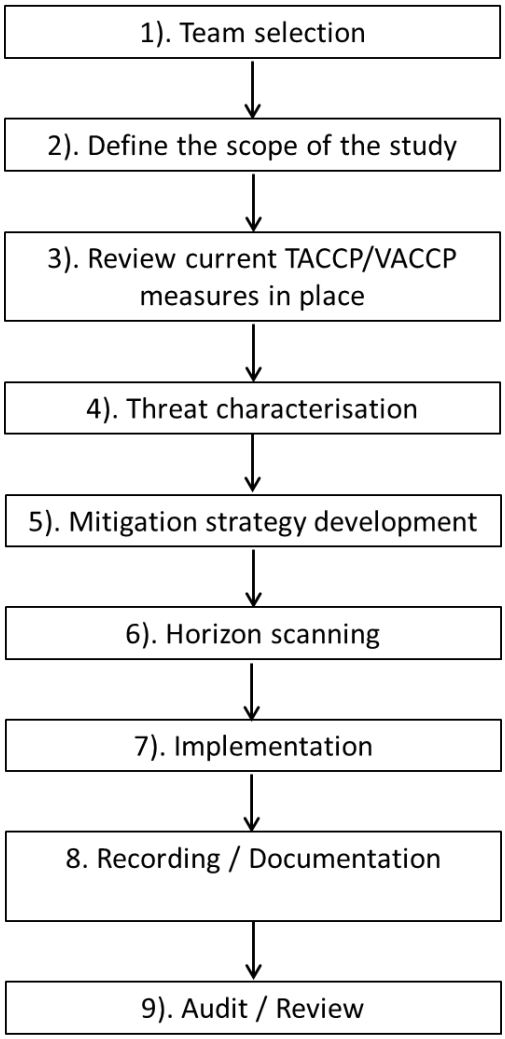

Figure 1: TACCP/VACCP route diagram.

The remainder of this guide will illustrate the TACCP/VACCP protocol by going, step by step, through this route diagram.

3. Team Selection

It must be realised that the TACCP/VACCP team will have a wider set of objectives when compared to a typical HACCP team. To obtain the best results it is essential to create a multi-disciplinary TACCP/VACCP team which is drawn from members of the site management team. If you consider that TACCP and VACCP, between the two protocols, covers the entire supply chain from raw material purchasing to final product storage and distribution, as well as related services such as power, water and personnel, it is clear that the TACCP/VACCP team needs to include a wide range of disciplines. Examples of the types of personnel represented on a TACCP/VACCP team are:

- Production and Operations

- Quality/technical
- Site Security
- Purchasing
- Human Resources
- Logistics/distribution
- Warehousing
- Engineering
- Information Technology

It is important for the TACCP/VACCP process to be a success that the team is resourced appropriately and is able to demonstrate senior management commitment to the process. It is also important that the membership, training, experience and awareness of the TACCP/VACCP team is maintained.

4. Define the Scope of the TACCP/VACCP Study

The scope of the study should be clearly defined from the outset. This gives the TACCP/VACCP team a clear remit of the issues or processes that are to be considered as in-scope.

When considering the scope of the TACCP/VACCP study it is worth deciding:

- Whether the study covers a particular product or process.
- If it considers a single site or takes a multi-site approach.
- If it looks at a region or covers the entire organisation.
- Whether the study is short term, addressing an immediate problem or issue, or longer term covering more strategic objectives.
- The types of threats or hazards to be considered.

By deciding these critical criteria at the start of the TACCP/VACCP study it is easier to define the extent and scope of the TACCP/VACCP study.

An example scope for the malting industry could be:

The hazard and risk of adulteration and/or contamination during the industrial production of barley malt from the intake and storage of barley through to the supply, as malt, to breweries, distilleries and food industries as well as the malting co-products produced by those operations and supplied as animal feed materials.

Once the TACCP/VACCP team has agreed upon the scope of the study a process flow is defined and documented. The process flow, similar to a HACCP process flow, details the process and all the steps within the process that is under consideration.

An example process flow is detailed below (Figure 2).

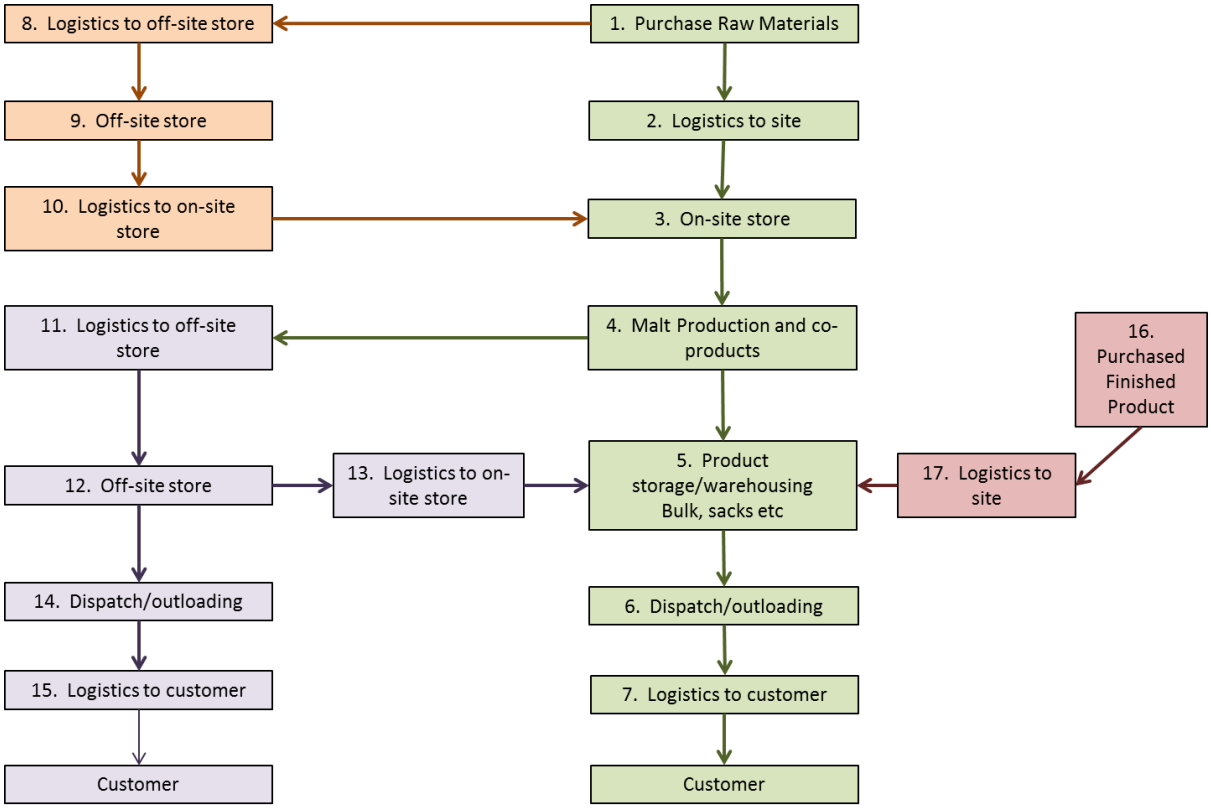

Figure 2: Example malting process flow for TACCP/VACCP.

It should be noted that although the process flow shares some similarities with the process flow for HACCP it encompasses the entire supply chain rather than just the manufacturers site.

5. Review Current TACCP/VACCP Measures in Place

It is highly likely that an organisation already has a number of steps or procedures in place that can be included as part of the TACCP/VACCP study. However, there are a number of pre-requisites which are essential for an organisation to have in place for a TACCP/VACCP study to be successful, these include traceability and supplier quality assurance. If the organisation has a recognised quality standard e.g. ISO 9001 or has implemented HACCP then these pre-requisites should already be in place.

Once the organisation has identified any current measures it is important that these are assessed as being effective and this assessment documented and reviewed on a periodic basis. For example most malting companies will have procedures in place for supplier approval, raw material specifications, intake checks, analysis and verification, traceability and site security. However, these will need to be reviewed as to whether they are fit for purpose in light of the threats identified during the TACCP/VACCP process.

As part of the review procedure it is useful to collate any lessons learned from previous contamination or adulteration incidents experienced by the organisation. Consider what procedures were implemented in response to the incident and whether these have proven to be effective throughout the business.

6. Threat Characterisation

Having defined the scope of the study and drawn up a process flow it is possible for the TACCP/VACCP team to define the threats that are relevant to the business.

In defining the threats the TACCP/VACCP team should consider the main types of threat to the business and where those threats may come from. Unlike HACCP the entire supply chain should be considered. Therefore the TACCP/VACCP team should consider elements of personnel, premises, processes, services, logistics and cybercrime as part of the threat characterisation process.

The threats that have been characterised can be systematically rated for their impact and likelihood by using the tables below for guidance.

Impact assessment criteria

Impact	Safety/Food Defence	Economic/Fraud
5 – Catastrophic	Death	Site closure
4 – High	Severe symptoms/hospitalisation	Brand damage
3 – Moderate	Generally mild symptoms, but some cases of hospitalisation	Regulatory non-compliance/recall/withdrawal
2 – Minor	Mild symptoms for a few days	Media activity
1 - Low	Mild symptoms, prompt recovery	No impact

Likelihood assessment criteria

Likelihood	Industry History
5 – Highly Frequent	Incident has occurred during the last 6 months
4 – Frequent	The last incident was recorded between 6 and 12 months ago
3 – Moderate frequency	The last incident was recorded between 1 and 2 years ago
2 – Low frequency	The last incident was recorded between 2 and 3 years ago
1 - Infrequent	The last incident was recorded over 3 years ago

The threats can then be risked assessed against a criteria for the likelihood and severity of a threat occurring. Using a risk matrix the threats can then be highlighted as either **NORMAL**, **HEIGHTENED** or **EXCEPTIONAL**.

A business may choose to implement its own risk scoring matrix but it is recommended that a 5 x 5 matrix is used. An example of the risk scoring matrix is shown below in Table 1.

Risk Scoring Matrix

Impact	5					
	4					
	3					
	2					
	1					
		1	2	3	4	5
	Likelihood					

1 - 4	Normal (low risk)
5 - 12	Heightened (Moderate risk)
15 - 25	Exceptional (High risk)

Table 1: 5 x 5 risk scoring matrix for assessing the significance of a particular threat to the business.

6.1. Understanding the Threats and Vulnerabilities

The three types of threat/vulnerability can be considered to be:

- Malicious contamination with materials that may present a threat to customers or consumers.
- Sabotage of the supply chain leading to supply and food issues.
- The misuse of food materials for either terrorist or criminal purposes.

Food fraud can also be considered in the threat characterisation process especially regarding the supply and use of specific barley varieties e.g. Maris Otter.

There are 7 main sources of food fraud that need to be considered for both ingredients and finished products within the TACCP/VACCP study which are:

1. Unapproved enhancements (e.g. use of unauthorised additives)
2. Counterfeiting
3. Dilution (Reduction of premium grade products by dilution with lower quality material)
4. Substitution (Declaring malt is made from a different variety than specified)
5. Concealment
6. Mislabelling (incorrect expiry dates, country of origin or malt type or variety)
7. Grey market production / theft /diversion

Some of the 7 main sources of food fraud will have more relevance to the malting industry than others. For example grey market production could be considered to be very low risk due to the high cost of production presenting a significant discouraging factor.

Having identified the threats and quantified the significance of the threats to the business there needs to be an evaluation of who is likely to attack the business and where the attack could be introduced by understanding the impact of personnel, premises, processes, services, logistics and cybercrime.

6.2. Understanding the Attacker

6.2.1. Personnel

An attack on a business is driven by an individual or individuals with a motivation to cause damage to that business. Therefore as part of the TACCP/VACCP process the TACCP/VACCP team must consider the threats to the business from people and the motivations that drive their actions.

As part of this process the team must consider the type of attacker and their position within the supply chain.

There are typically four classes of potential attackers which need to be considered.

The classes of individuals are:

- **Outsiders** – Those individuals with no current contact with the business.
- **Supply chain personnel** – No direct contact with the business but have access to the wider supply chain with which the business interacts.
- **Suppliers/Contractors** – Trusted status so will have direct contact and open access to areas of the business.
- **Insiders** – Ongoing direct contact with the business as permanent/temporary/agency members of staff.

It is typical to conduct a risk assessment on these four groups to understand the threat that they pose to the business and the mitigation measures required to reduce the risk of an attack.

Group	Direct Opportunity	Means	Mitigation Measures
Outsiders (e.g. members of public)	**Low** They have no direct access to production facility or supply chain.	No direct access to supply chain or malting site but can gain access by exploiting weak security procedures.	Controlled site access. Effective cyber security measures. Control of raw materials or finished product in the supply chain.
Supply Chain Personnel	**Medium**	Access to raw materials or finished	Procedures in place to ensure that suppliers and the wider supply

(e.g. Hauliers, barley merchants, storekeepers, off-site storage)	They have legitimate access to the supply chain and to raw materials or finished goods.	goods in the supply chain.	chain have adequate control measures in place. Validation of security procedures by audits.
Suppliers/Contractors (e.g. Security, cleaning contractors, maintenance personnel)	**Medium** They have legitimate direct access to the malting site.	With trusted status they will have direct access to raw materials and finished goods at the malting site.	Vetting procedures and full contractor induction prior to gaining access to the malting site. Use of permits to work and control/restrictions placed on where they may be allowed to work. Regular review of their continuing suitability to work on site.
Insiders (e.g. employees, temporary staff, agency staff)	**High** Direct and extensive access to the malting site.	With trusted status they will have direct access to raw materials and finished goods at the malting site.	Pre-employment vetting. Site induction prior to start. Implementation of restricted areas of work i.e. access only to certain areas of the plant. Regular performance/progress reviews.

Having classified potential attackers and identified mitigating measures to control the risks it is important to identify potential motives for an attack. These can be grouped into 8 clear motivations which are:

1. Criminal/Extortion
2. Food fraud – e.g. a financial advantage gained by adulterating or substituting a raw material.
3. Commercial competition
4. Disaffected employees
5. Ideological – e.g. a company operating in an area of conflict or a country which has been criticised for human rights violations.
6. Mental Illness

7. Local Pressure – e.g. issues with neighbours.
8. Sector Pressure – e.g. animal welfare or environmental pressure groups.

6.2.2. Premises

As part of the TACCP/VACCP procedure the threats and vulnerabilities associated with the premises need to be considered. For a malting site this would include everything from weighbridge and barley intake through to finished product dispatch. If there is any third party storage of either raw materials or finished goods this would also need to be included in the assessment.

Some areas for consideration are:

Site Security – How is site security managed? Is it via an external contractor or the site management team. If the site security is provided by an external contractor then a member of the security team needs to be involved in TACCP/VACCP and its implementation.

Site perimeter – How is the site perimeter controlled to prevent unauthorised access. For sites with no perimeter fence or wall consideration needs to be given to how sensitive areas of the site are protected. For sites that have a perimeter fence or wall it is necessary to review, on a regular basis, its fitness for purpose.

Access to site for vehicles and pedestrians – How is this controlled? What entry and exit points are there for the site? Are they controlled? What is the process for managing visitor, haulier and contractor vehicles on site?

Screening of visitors – Methods for controlling and screening visitors to site need to be reviewed. Consideration needs to be given to how access to sensitive areas is controlled whilst visitors are on site.

Access to production facilities – How is access to both staff and visitors controlled. Do production areas have restricted access or are they freely accessible? If there are areas where access is restricted how is this managed?

6.2.3. Process

In most cases the HACCP plan will have identified the process issues that may have an impact upon raw materials, malt and malt products. Much of this can then be reviewed as part of the TACCP/VACCP process. In particular if there is access to process sensitive equipment who has access to it and how is it controlled. Thought, therefore must be given as to how this is managed as part of the TACCP/VACCP process.

Many malting companies store significant quantities of raw material and finished product on site. Therefore procedures for ensuring that both raw material and finished product are not susceptible to malicious attack should be reviewed.

6.2.4. Services

Malting companies consume considerable amounts of gas, water and electricity. A deliberate malicious attack on any of these services could have severe consequences on the business. As such it is prudent for the TACCP/VACCP team to understand the potential threats from a malicious attack on

their services. For example if a malting site utilises on-site boreholes for process water the TACCP/VACCP team must consider how the boreholes are protected against a malicious attack.

Other areas of consideration, in terms of services, are drainage and cleaning systems as well as air inlets into areas such as germination vessels.

6.2.5. Logistics

Logistics is a key consideration for the TACCP/VAACP Team as in many cases malting companies rely on third party haulage. It is also an area of the supply chain where the malting company has a reduced level of control. The TACCP/VACCP team would need to consider the type of packaging and transport that is employed for their raw materials and finished products. For example malt transported in 25 kg sacks on pallet, in bulk lorries or export containers should be considered individually. For example an export container with tamper proof seals could be considered a lower risk than a bulk lorry which is only secured by a weather proof sheet.

6.2.6. Cybercrime

The impact of cybercrime is often overlooked by a business and in some cases is not considered as part of a business's risk management procedures. However, cybercrime is a growing problem and there have been incidents where cybercrime has been used against food businesses. For example in June 2017 a cyber-attack halted production at a food factory in Tasmania after its IT systems were infected by ransom ware. The IT systems at the factory were shut-down and a ransom demanded for their restoration. It is therefore essential that a member of the IT team is part of the TACCP/VACCP process. Examples of threats to consider relating to cybercrime would be:

- The effectiveness of security systems and firewalls
- Use of personal devices by staff in the workplace
- Security and integrity of system passwords
- Ensure that outsourcing of ICT support is secure and not vulnerable to attack
- Introduction of policies and procedures to raise awareness of the risks from malware infection

7. Mitigation Strategy Development

The TACCP/VACCP team, having identified the threats to the business, will need to develop and evaluate mitigation strategies for all significant threats and vulnerabilities. Therefore high likelihood/high impact threats would need to have mitigation strategies developed and implemented.

The mitigation strategies that have been developed need to be collated and documented in a central TACCP/VACCP register.

Controls should be implemented to raw materials, packaging, finished products, processes, premises, distribution networks and business systems to reduce and remove threats.

Key decisions where changes to the business are required need to be agreed by and have senior management sign off.

Following implementation the mitigation strategies need to be reviewed to assess if they have been effective. If effective the risk rating for that threat can be lowered in the TACCP/VACCP risk assessment.

8. Horizon Scanning for new and emerging threats

For TACCP/VACCP to be successful there needs to be a continuing process of reviewing the threats and vulnerabilities, understanding how they may change and whether there are any new threats or vulnerabilities to the business.

The Food Standards Agency highlights that for the successful determination of emerging threats a business needs to have four components in place which are:

1. A framework in place
2. An intelligence strategy which helps to define when and where to look for emerging risks
3. Reliable data sources
4. Skilled human intervention to understand if the emerging threats represent a real risk to the business

For most companies if there is a HACCP plan then there should be a framework already in place for horizon scanning. The framework would therefore need to be adjusted to include TACCP and VACCP. However, if a framework is not already in place a company may introduce a framework which identifies who is responsible for collating emerging threats and the frequency that they undertake this activity. The framework then identifies when the TACCP/VACCP team is notified of the emerging threats and the process by which they evaluate if those threats present a significant risk to the business.

There are many sources of information for horizon scanning open to a malting company. Some of these can be considered to be industry specific such as the MAGB, Euromalt and Campden BRi. However more general areas for intelligence on emerging threats are government bodies such as the Food Standards Agency or the European Food Safety Authority.

9. Implementation

The TACCP/VACCP team needs to consider the impact of implementing a TACCP/VACCP protocol on the business. Having characterised the threats and mitigation strategies those strategies need to be documented and cascaded through the business. For example if there are any mitigation strategies that require a process change in malt out-loading these need to be documented within the company's existing quality systems. The process change then needs to be communicated to all operational staff and contractors who may be impacted by the process changes.

The implementation process also provides an opportunity to test and challenge the TACCP/VACCP mitigation strategies to ensure that they work as intended in the real world.

10. Recording and Documentation

The TACCP/VACCP protocol needs to be recorded in an appropriate way with consideration of:

- The business sensitive procedures that may have to be amended.
- Records of TACCP/VACCP review meetings and any decisions that may arise from those meetings.
- Full process flow diagrams that will need to be documented and maintained.
- Incident logs to be kept of occasions where a threat has been made against the business.
- Training exercises conducted by the business to test the effectiveness of the TACCP/VACCP plan.

Clearly the documentation of TACCP/VACCP would be part of the malting companies existing quality management system.

11. Audit and Review

The TACCP/VACCP plan should be viewed as a dynamic and evolving document as threats posed to a business will change over time. It is therefore essential that there is a process conducted where the TACCP/VACCP team systematically reviews the TACCP/VACCP plan. The process should include a review of what is currently in place in terms of the threats that have been characterised and the mitigation strategies employed.

Any incidents that have occurred since the last review need to be scrutinised to identify if the mitigation strategies employed were sufficient to reduce or remove the impact of the threat.

As part of the review process there needs to be a consideration of the horizon scanning activity that has been introduced. This is done to highlight if any new threats have been identified that may pose a risk to the business.

Regular audits should be conducted to validate that the threat mitigation strategies have been fully implemented.

12. Further Reading

The following are recommended documents for additional reading when implementing a TACCP/VACCP protocol.

Campden BRI TACCP/VACCP: Threat and Vulnerability Assessments – Food Fraud and Food Defence. A Practical Guide (Second Edition)

Publicly Available Specification (PAS)96:2017 Guide to Protecting and Defending Food and Drink from Deliberate Attack. Published by BSI Standards Limited 2017. ISBN 978 0 580 98099 2