

A Review on Application of Halalan-Toyyiban Risk Management Plan (HTRMP) and Frozen Food Chain during Warehousing Activities for Maintaining Halal, Safety, and Quality

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ABSTRACT

Halalan-toyyiban food supply chain has become the most important concept of the global Halal market and Halal food industries. The main objective of Halalan-toyyiban food supply chain is to preserve the Halal integrity, safety and quality of Halal food products in the whole chain of product movement. This paper highlights the concept of Halal frozen food chain that covers the issues of food Halalness, the safety and quality aspects of frozen food products along activities on warehousing stage. A cold chain provides the essential facilities and methods required to maintain the Halal and quality of foods. Since foods can be easily contaminated and/or affected which may change their Halal and toyyiban status so that they need highly concern in term of Halalan-toyyiban Critical Control Point (HTCCP) during warehousing activities of frozen foods. Halalan-toyyiban Risk Management Plan (HTRMP) is used to determine the potential contaminated and affected frozen foods along the food supply chain especially during warehousing. Hence, this HTRMP can be as a guideline to the cold warehouse for maintaining the Halal and toyyiban status of frozen food products.

KEYWORDS: Frozen Food, Halalan-Toyyiban, HTRMP, HTCCP, Warehousing Activities.

INTRODUCTION

Muslim population is rising to a projected figure 2.8 billion or 30% of the world population, which are 9.3 billion in 2050 [31]. This will lead to a drastic growth in the Halal industry as Muslims are certainly required Halal products [38]. Other than that, the current growing trend of people choosing a healthier lifestyle has made Halal food products a superior choice due to the reason that these products have been acknowledged as clean and safe for consumption [47]. Furthermore, the demand for Halal food products does not come just from Muslims consumers but there are also many non-Muslim consumers that strongly prefer Halal food products due to their perception of Halal products as a healthier and safer choice [13, 15]. This statement has been supported by [43] who claimed that there is a significant increase in consumers' demand for food products that comply with Islamic law such as food products that do not contain pork and meat that follows the Islamic slaughtering process.

The Halal supply chain is a new idea in which Halal products and non-Halal products are handled separately as required by Shariah law in order to avoid cross contamination. This is due to preserving the Halal integrity of the products for consumption [25]. Halal warehousing is one of the activities in Halal supply chain services which plays a big function in the growth of the Halal food industry by ensuring the continuing integrity of the Halal products [16, 27]. Nevertheless, this article will be discussed on warehousing activities along the Halal frozen food warehouse. Since it is a new approach to handling finished products, there are only a few logistics service providers that use the correct method according to JAKIM and its affiliates [26]. Halalan-toyyiban Risk Management Plan (HTRMP) is one of the approaches that were introduced by JAKIM, where risk factors at the Halalan-toyyiban critical control points (HTCCP) are monitored and control measures are implemented to prevent or eliminate a product from contaminant and affected by non-toyyiban precursor or reduce it to an allowable level [21].

A cold chain is a sequence of control in the production and distribution of products in order to store them at a suitable temperature starting from production to the end consumers [19]. Nowadays, the growing demand for temperature-controlled products especially fresh agricultural products and manufactured food make cold supply chain has become more important within the increasingly global economy [41]. However, this paper will be focusing only on Halal frozen food chain. Frozen foods are food products that undergo the freezing process where heat is removed to reach a certain temperature. The temperature will then be maintained below the initial freezing point [37]. According to MS2400-2: 2010, frozen products are products that were kept at a temperature below -18°C for one continuous period starting from the time of preparation until the end consumers and has never been thawed before the sale (Department Standard Malaysia). This paper highlights the concept of Halal frozen food chain that covers the issues of food Halalness, the safety, and quality of frozen food products as well as the processes involved in the warehousing stage.

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LITERATURE REVIEW

Halalan-Toyyiban Concept

Halal is an Arabic word which defined as lawful or permitted as prescribed by Islam [18]. *Toyyib* means wholesome, pure, nutritious and safe. According to [2], the term Halal encompasses cleanliness and hygiene in food preparation because cleanliness is part of religion and Allah only permits hygienic, safe and Halal products for Muslims' consumer. This is clearly highlighted in the following ayah of the holy Quran where He says:

“O mankind! Eat the lawful and good things out of what is in the earth, and do not follow the footsteps of Satan; surely he is your open enemy.” (Surah Al-Baqarah: 168).

Toyyib can also be defined as high-quality goods and products which are clearly reflected in Allah's command in Surah Al-Baqarah Verse 172, “O ye who believe! Eat of the good things wherewith We have provided you, and render thanks to Allah if it is (indeed) He whom ye worship”. 'Good things' in the verse refers to products that are good and pure in terms of quality and Halalness [44]. This verse also encourages Muslims to find sustenance and consume food which is Halal and *toyyib* as it ensures a better and healthier life that will result in better attitudes and behaviors [29].

In this era of technology, the Halal concept should not be characterized only as food that is free from pork in its physical presence, but it covers an abundance of groups, for example, additives such as stabilizers, flavouring, colouring and other related additives, emulsifiers and other food ingredients such as gelatin, enzymes, lecithin, and glycerin. In the recent development of food technology, the issue that has turned into the most discussed topics is genetically modified food or GM food [46]. The overall conclusion that can be assembled from the discussions is that the ingredients of these foods are Halal as they follow to the permitted level of addition in order to maintain the *toyyiban* aspect in term of food safety and safe for consumption.

Halalan-Toyyiban Food Supply Chain

Halal food supply chain begins from the farm and completes with the end consumers. To guarantee the integrity of Halal food production, handling its supply chain calls for extra attention [23]. Halal food supply chain comprises the process of scheduling, executing and directing the effective flow and storage of Halal certified products beginning from the source at the demand point. It can also be referred to as the process of dealing the procurement, movement, storage and handling of food products in the organization and the supply chain so it will fulfill with the general principles of Shariah law [47]. In [28] claimed that throughout the entire supply chain processes, there is a high risk that the Halal products can be exposed to contamination especially if the goods are carried by logistics service providers (LSP) that do not commit to handling and transporting only Halal products. This may be due to lack of understanding and awareness among the workers that handle Halal products.

The Halal concept in food processing is not only limited to the materials and ingredients used throughout the manufacturing processes but also includes the overall aspects of a food supply chain including but not limited to personal hygiene, clothing, utensils and the working area [32]. The warehouse service providers should take necessary measures to comply with Good Manufacturing Practice (GMP) and Good Hygiene Practice (GHP) as well as Hazard Analysis Critical Control Point (HACCP) to confirm that the food products are safe for consumption [2]. Therefore, to preserve the Halalan-*toyyiban* status of food products, these practices must adhere together with Halal food standard. As the food products are Halal certified, the Halalness of these products should be retained until the food products are consumed by following the proper Halal supply chain processes [25].

Halalan-Toyyiban Assurance Pipeline

Logistics is a piece of supply chain process that plans, implements, and controls the effective flow and storage of goods, services, and related information from the point of origin to the point of consumption in order to meet clients' necessities [39]. Logistics management involves a series of activities includes transportation, storage and warehousing, inventory management, material management, product scheduling and customer service [38]. The primary reason for logistics is to guarantee that clients will have the capacity to appreciate, utilize or use the items at the correct time, in the exact amount as well as having the right description and confirming that the products will be in a good condition [39]. In 2010, Department of Standards Malaysia announced standard for Halal logistics which comprise of:

- a. MS2400-1:2010 (Halalan *Toyyiban* Assurance Pipeline-Part 1: Management System Requirements for Transportation of Goods and/or Cargo Chain Services),
- b. MS2400-2:2010 (Halalan *Toyyiban* Assurance Pipeline-Part 2: Management System Requirements for Warehousing and Related Activities) and
- c. MS2400-3:2010 (Halalan *Toyyiban* Assurance Pipeline- Part 3: Management System Requirement for Retailing).

The main reference used by JAKIM in Halal auditing and certification process is Halalan-toyyiban Assurance Pipeline standard. In [41] stated that logistic providers who might want to provide Halal logistic services need satisfy standard necessities such as the Halalan-toyyiban Management System, Halalan-toyyiban Management Plan and Halalan-toyyiban Assurance Pipeline for their premises, infrastructure, facilities and personnel. According to [39], there are plenty of issues and troubles along the Halal supply chain stages that involve the producers, retailers, service providers and consumers result from lack of standardization in Halal certification.

Warehousing Activities

Warehousing is integrally involved in the whole supply chain operation processes and warehouses play different roles at different stages. A warehousing process usually consists of a number of sub-processes, including the sequence of receiving, storing, picking, packing and shipping [22]. In [36] described the warehouse operation consist of 4 main processes which are receiving, storage, picking and picking. It explained in detail the processes starting from receiving activity that includes routines such as physical receipt of goods, unloading, and verification of quantity, followed by quality check and system update. While storage process comprises storage location selection, physical goods movement, goods consolidation, sorting, cross-docking, and updating system. In picking, there are product location and product collection, order formation, packaging and also pallets formation. Lastly in shipping process involves packing list, quality control, invoice and order control, system update and loading. [36]

Halal warehousing activities stringently stressed on the separation of Halal foods and non-Halal foods to avoid cross-contamination as well as the tools used to handle the products such as rack, pallet or load carrier [26]. Once Halal products enter the warehouse, all tools such as pallets or load carriers that will be used to handle the products must be prepared from different sets of the sets that have been used to handle the non-Halal products [27]. On the other hand, in [26] also stated that warehousing activities need to comply with Halal standards as there are convincing evidence that goods expended more time in warehousing stage compared to the transportation stage.

Frozen Food Chain

Cold Chain Management (CCM) implies a system of facilities and distribution options that implement the typical function of a standard supply chain cycle which includes temperature and humidity control during the supply chain stages [40]. In [35] defined the term "cold chain" as a series of dependent equipment and practices applied to guarantee the temperature management of perishables and other temperature controlled products from the production to the end consumption in a safe, wholesome and great quality condition. In a cold chain, the shelf life, safety, and quality of perishable foods along the supply chain is greatly affected by environmental factors especially temperature. The rise in temperature of just a little degrees bring about microbial development prompting to lower the quality of foods, spoiled the foods and a higher risk of food poisoning [6]. In [4] viewed cold chains as a temperature controlled supply chains, which can assure and prolonging products such as prolonging the shelf life of food products. Therefore, in [4] also pointed out that cold chains can be managed by quality management systems and it should be analyzed, measured, controlled, recorded and verified.

In the food industry, freezing is the most popular long-term preservation method. Besides being convenient products for consumers, frozen foods are also well-known because they remain to show a good food safety record since freezing can efficiently lessen the activity of microorganisms and enzymes thus delaying deterioration. Furthermore, crystallization of water decreases the volume of fluid in food items and prevents microbial development [37]. In [6] stated that perishable foods need proper temperature-controlled environments during the production, storage, transportation and sales processes to maintain the food quality and reduce food losses. There is some example of perishable products like fruits, vegetables, flowers, fish, meat and dairy products [35]. In [6, 35] agreed that there are some temperature points for food to outfit different types of product groups such as:

- i. frozen is -25°C for ice cream, -18°C for other foods and food ingredients;
- ii. cold chill is 0°C to 1°C for fresh meat and poultry, most dairy and meat-based foods, most vegetables and some fruit;
- iii. medium chill is 5°C for some pastry-based products, butter, fats, and cheeses;
- iv. exotic chill is 10-15°C for potatoes, eggs, exotic fruit and bananas.

In [20] claimed that one of the essential characteristics of a logistics system for frozen foods is the preservation of product quality, which relies on the period of distribution time and variant of temperature in the cold chain. In [20] stated that several temperature fluctuations throughout the warehousing activities might cause loss of flavour or even damage. Hence, for food safety and quality, the temperature must be cautiously and constantly observed and controlled at every point of the warehousing activities because frozen foods are classified as perishable products.

Frozen foods also may deteriorate similarly to some other foods during storage by different modes or mechanisms such as flavour changes, drip loss, discoloration, physical changes that could lead frozen foods

become unacceptable [12]. In [12] explained that microbes are generally not a big issue but enzymes come to be a big worry for frozen foods which it can cause flavour change and promoted deterioration of products. Hence, drip and mushiness may occur upon defrosting by cell damage or protein and starch interactions during the freezing process. Discoloration might occur by non-enzymatic browning, bleaching and freezer burn, while inconsistent temperatures resulting physical changes such as package ice formation, moisture loss, emulsion destabilization and recrystallization of sugars and ice in frozen desserts.

The need for securing food safety and quality is directly related to physical, biological and chemical parameters, which commonly interact with each other, for example, temperature and moisture. In general, quality degradation of food products relies on the storage time, the storage temperature and other parameters such as relative humidity, hygienic and etc. [45]. The development rate of most human pathogens can be decreased by strict temperature control all through the supply chain as its also can reduce the risk of food-borne illnesses [7]. Hence, it is important to implement the HTRMP so that Halal-toyyiban critical control point (HTCCP) can be determined and monitored in order to prevent or eliminate the risk of Halal status become contaminated with non-halal elements. This can also aid in controlling and maintaining the quality and safety of frozen food products during warehousing activities.

Halalan-Toyyiban Risk Management Plan (HTRMP)

Risk or hazard has been defined as the probability that injury, danger or damage will result from the uses of the substances in the proposed quantity and manner [3]. The risk is often associated with situations that lead to negative consequences. A more standard definition of risk is the chance for the hazard to occur. Supply chain risk is defined as “the potential occurrence of an incident or failure to seize opportunities with inbound supply in which its outcome results in a financial loss for the purchasing firm” [1]. Throughout the food supply chain, the processes involve a lot of handling points. It shows that handling points can be one of the critical control points in which the Halal status of a food product might be affected if the concept of Halal integrity is not completely comprehended by all parties incorporated in the supply chain, especially those who are involved directly in the operational handling aspects [48].

As discussed earlier, frozen storage is widely used to control microbial development in perishable foods. This is due to the reason that freezing can maintain quality and prolongs shelf life by keeping the temperature of a product at the point where metabolic and microbial deterioration is minimized. However, frozen storage of perishable foods has been proven to be a potential risk factor for the development of microbial hazards that leads to foodborne illnesses if the temperature failed to be controlled at a suitable level. Proper temperature control not only protects the safety but also maintain the quality of food [5]. Hence, the potential risk must be controlled and monitored in order to maintain the Halal and toyyiban (safety and quality) of food products. Halal status of food products also may be adulterated if the products are contaminated with the non-halal precursor.

Foodborne disease outbreaks and incidents including those arising from natural, accidental and deliberate contamination of food [5]. It has been identified as one of the most widespread public health problems [11]. In [5, 11] agreed that the problems that arise are mainly due to poor personal hygiene, improper handling of food, contaminated food surfaces or equipment, the consequence of a failed process and inappropriate storage conditions during distribution, the food service or by the consumer. Food may be accidentally or deliberately contaminated by microbiological, chemical or physical hazards [11] Hazard as stated in [10] is a biological, chemical, physical agents or condition of food with the possible to cause an adverse health effect.

The HACCP system is the preventive action needed to maintain the hygienic condition while minimizing and eliminating the potential hazards during food handling at warehouses [8]. By utilizing the critical control points (CCP) in the warehousing activities, the risk can be controlled, reduced or eliminated [30]. The elimination of the risk can be guaranteed or decreased by maintaining it at a level below critical limit through monitoring the CCP. The monitoring of CCP is perception and estimation of potential hazard from that critical control point which is accomplished thorough investigation, sensory evaluation, physical records, chemical and microbiological analysis [30]. The Halal critical control points (HCCP) can be identified through the HACCP's critical control points (CCP). In conclusion, the HCCP supplements the HACCP requirements by adding the requirements to make the products Halal-compliant [34, 8]. Thus, to identify potential risk in the Halal food supply chain, the application of HTRMP is suggested at all handling points involved. The general principles of HTRMP that was outlined by [9] in MS2400-2:2010 consist of seven steps:

1. Identification of Halalan-toyyiban potential contaminant and/or precursor: Together with the Halalan-toyyiban committee, develop a flow diagram for all those process operations by listed all potential contaminant and/or precursor related with the processes.
2. Determination of control measures: List of measures that will eliminate or prevent the contamination suitable to the Halalan-toyyiban perspectives.
3. Determination of Halalan-toyyiban Critical Control Point: Identify the HTCCP (a stage at which control can be applied and is necessary to remove the contaminants and/or precursors).
4. Determination of a monitoring system for Halalan-toyyiban Critical Control Point: E.g., Decide a scheduled sequence of observations or measurements to examine the degree of control on identifying HTCCPs.
5. Determination of corrective actions to Halalan-toyyiban Control Point: Recognize a predetermined action for when the HTCCP shows a loss of control.

6. Determination of verification procedures: Create and apply methods to confirm that the HTRMP system is working as well as supporting evidence, e.g. auditing, process validation.
7. Documentation system and management of records: Develop and maintain procedures and practices for record keeping.

The ability to identify and address the halal CCPs will reduce the vulnerability of the halal food supply chain [42]. It will reduce the doubtfulness among halal consumers on the integrity of the halal food products that they consume is well protected [49]. According to [17], the majority of logistics providers, the industry, and port authorities managed to ensure the Halal integrity by the following methods such as segregation (partition and packaging), temperature control (temperature abuse) and designated warehouse as the critical control point (CCP).

In [42] were discussed for wet or frozen food products and since it is risk related, segregation between halal and non-halal food is a need whereas, in the dry environment, segregation between halal and non-halal is mainly based on perception. Furthermore, it is crucial for corrective actions to be identified in halal logistics in order to sustain consistency of minimum integrity level throughout the supply chain covering transportation and warehouse. Halal products will be stored in a different storage space such as a warehouse, transit place, and the transportation units for a total physical segregation [48]. The segregation process also should be practiced during receiving activities at warehouse inbound. For example, there should be a different receiving area for wet and dry products. Besides, the tools, equipment, and workers that were involved in the receiving activities should be different at different inbound. Thus, this may prevent the risk of cross-contamination during the process.

In [17] found that there are some logistics providers who agreed to assign a designated space or segregation area to avoid cross contamination or mishandling of halal and non-halal products during storage. Some logistics provider suggested that in order to preserve freshness and quality of the products, the cold room should be kept and controlled at a suitable temperature depends on types of products. This is due to the reason that the products are considered haram if they are found spoilt or in a damaged condition. Other than that, some Halal logistics providers also stated that other possible reasons that might lead to contamination 'Halalness' in the frozen food chain are unsanitary cold truck, a mixture of Halal and non-Halal products, injuries due to handling, product deterioration due to injury, product damage due to stacking, unsuitable environment, lack of hygiene and workers' health conditions.

Halal Assurance System in Food Supply Chain

At present, the Department of Islamic Development Malaysia (JAKIM) has made it mandatory for all new applications for Malaysian Halal certification to implement Halal Assurance System [14]. Halal Assurance System (HAS) is a system designed, applied and maintained by a company which is certified Halal to guarantee the sustainability of its Halal production, hence assuring the Halalness of its products. The objective of HAS is to retain the sustainability of Halal development process and management in order to assure its Halalness in line with the rule explained by the Halal authority such as JAKIM. Halal Assurance System (HAS) is an element of a company management policy and must be documented. As being a management system, the key components of HAS are Halal policy, planning, implementation, monitoring and evaluation along with the corrective action in a cycle [33]. In [24] also claimed that the assurance system included between organizations enabled the complete supply chain to become attentive to end-customers' demands by potentially producing products with Halal certification as a mean to fulfill customers' needs.

HAS guideline aids organization to develop, implement and improve the overall effectiveness of the system that controls Halal standard. This system focuses on minimizing and removing the non-conformance of the Halal condition. The guidelines highlight on the Halal assurance management from the Halal-toyyiban Critical Control Point (HTCCP) in the whole organization and its supply chain by having constant in control, monitoring and verification. It should also include efficient product recall procedures, effective records as well as good filing system [50]. It is essential for all activities in logistics companies to apply HAS as their general guidelines to guarantee the integrity of Halal products along the supply chain process. An assurance system confirms that each substance along the supply chain of Halal products will fulfill the Halalan-toyyibban requirements for all aspects, for example, management system, Halal risk assessment, Halal facilities, equipment and infrastructure [41].

CONCLUSION

Nowadays, frozen food has become the fastest growing sector in the food industry. Hence, it is important to monitor the Halal frozen food chain in order to preserve the Halalness, safety and quality of frozen food products in the supply chain. This paper highlights the use of Halalan-toyyiban Risk Management Plan (HTRMP) to prevent or eliminate the potential contaminant during the warehousing stage of frozen food using the Halal Critical Control Points (HTCCP), where the risk can be prevented or eliminated. As per discussion on the early section, temperature monitoring is the main factor should be controlled in order to prevent frozen foods are spoiled. Besides, there are several possible sources that may cause contamination such as dirty cold truck, a

mixture of Halal and non-Halal products, injuries due to handling, product deterioration due to injury, product damage due to stacking, environment and hygiene, workers' health and conditions, segregation (partition and packaging) and designated warehouse. Hence, the risk is prevented or eliminated as well as the elimination of the risk is to ensure by monitoring HTCCP.

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