

Issues on Activated Carbon Filter in Halal Water Dispenser Machine from Online Shopping: A Review

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ABSTRACT

Water is a universal natural resource that sustain the quality of human daily life, health, and wellbeing. Drinking water is highly recommended as it provides protection against dehydration and other related ailments as well as beneficial mineral intake. In this modern era, water is needed everywhere and safe water become a solid fundamental requirement for human life. A safe water source is the most crucial matter in providing a quality of safe water, lead to the rise of technological advance facilitates development of water dispenser machine as drinking water storage which ease the consumer to drink safe and clean water in the easiest way along with bonded contract basis. Activated carbon filter is the main component used widely in the water treatment for water dispenser as it possesses adsorption properties and responsible for uptake of pollutants. However, this carbonaceous substance is commonly found in animal-based material derived from animal bones. Halal related issues raised when the contract ended and maintenance provider is no longer available. As a result, consumers take their own action to repair it by themselves and obtain the activated carbon filter from online shopping platform due to cheaper price. In this platform, there are many activated carbon filter products sold, the concern here are more on unknown material especially derived from non-halal sources. Thus, this paper reviews the roles and importance of activated carbon in the water dispenser in order to provide safe and clean water. In addition, the source of activated carbon obtained from online shopping platform which raises doubt in halal status also will be discussed in this paper.

Keywords: Water, Water dispenser, Halal, Activated carbon filter, Online shopping

1. INTRODUCTION

Water is a universal natural resource that sustain the quality of human daily life, health and wellbeing. Chemically, it is found in the form of H₂O, a combination of two molecules of hydrogen (H) and one molecule of oxygen (O₂). Most of the earth surfaces are 97 percent covered by water, therefore safe and clean water is essential for agriculture, cooking, drinking, preparing infant formulas, weaning foods and industrial area. Among these uses, drinking is the paramount need. Drinking water is highly recommended as it provides protection against dehydration and other related ailments. Apart from hydrating function, this drinking water leads to the beneficial mineral intake (Abtahi, et al., 2016) and inorganic impurities that essential nutrients for humans such as calcium (Ca), chloride (Cl), copper (Cu), fluoride (F), iodide (I), iron (Fe), magnesium (Mg), manganese (Mn), phosphorus (P), potassium (K), selenium (Se), sodium (Na), zinc (Zn), etc (Dutra-de-Oliveira & Nogueira de Almeida, 2002). People have the right to access on safe and clean drinking water, regardless of color, creed, nationality, religion or wealth.

In this modern era, water is needed everywhere and safe water become a solid fundamental requirement for human life. A safe water source is the most crucial matter in providing a quality of safe water, to avoid undesirable issues on poor drinking water quality that could potentially lead to many waterborne diseases. A study done by Li and Wu (2019), quality of source water, the treatment in water treatment plants before distributed, the water distribution system and the

containers/tanks used for water storage and the house-hold filters affect the drinking water quality. The rise of technological advance facilitates development of water dispenser machine as drinking water storage which ease the consumer to drink water in the easiest way. In addition to store water, it functions primarily as a direct access to drinking water. In Malaysia, water dispenser unit serve as a main facility of household, institution and office. Adequate water consumption for human is becoming a good habit and trend among people nowadays due to their awareness on importance of water in healthy life.

Besides, the primary part that made water dispenser function as its intended use is the filters. Activated carbon filter is one the filters in the filtration system of water dispenser. It is known as amorphous carbon-based materials that is prepared to possess an extended surface area and a high degree of porosity (Bansal & Goyal, 2005). In fact, this filtering agent has been familiar as the oldest and widely used adsorbent for the water and wastewater treatment for removing organic and inorganic pollutants throughout the world. However, activated carbon filter as commonly found in the form of animal bones; bovine and porcine sources. Halal related issues raised when the contract ended and maintenance provider is no longer available. Consumers take their own action to repair it by themselves and obtain the carbon filter from online shopping platform due to cheaper price. Due to that, price, quality, halal, review and feedbacks are becoming the influencing factors for consumer selection and purchasing decision via online shopping platform. In this point of view, halal matters such as Halal logo and product specification must be highlighted as top priority rather than other matters in ensuring the supply of drinking water for daily consumption is halal, clean and safe.

2. LITERATURE REVIEW

Water dispenser machine is an electronic equipment that provide easy access to a safe and clean drinking water. This domestic equipment is capable to serve as drinking water storage for hot and cold water. Other than that, it is equipped with two faucets in manual and one faucet in automation to drain the water according to selected consumer preference types. The water dispenser is also divided into two main categories; direct-piping water dispensers and bottled water dispensers either free-standing or countertop unit. Typically, the storage capacity for cold and hot water tank are in the range of 0.5 to 5 liter per hour and up to 5 liter per hour, accordingly (Oasis International, 2023). Hence, it can be considered as one of the best technological innovations that provide lots of health benefits, convenient and facilitate human works in the daily life.

Despite in resolving the issue of drinking water quality, development of water dispenser is indeed an absolute approach. Poor quality of drinking water might be a huge problem and encounter significant impacts toward consumer health. Transmissible diseases such as cholera, diarrhea, dysentery, and polio are the implications resulted from contaminated drinking water and poor sanitation (WHO, 2018). Li and Wu (2019) in a study stated that quality of source water, the treatment in water treatment plants before distributed, the water distribution system and the containers/tanks used for water storage and the house-hold filters affect the drinking water quality. According to Farkas et. al. (2012), microbiological hazards is one of the influencing factors contributes to the deterioration of water quality, since microbial contamination contributed to majority of evident water-related health problems. Therefore, a safe water source from water dispenser machine is the most crucial matter in providing a quality of safe water, to avoid undesirable issues on poor drinking water quality that could potentially lead to many waterborne diseases.

From the above findings, the needs of water dispenser become necessarily for a safe and clean supply of drinking water especially in each household. Other institutions such as

collages and offices which are commonly superstructure buildings and occupy a large workforce really needs at least one or two unit of water dispensers on each level for their staffs or students to have access for drinking water and promote healthy lifestyle. In Malaysia, almost each household has one unit of water dispenser and placed along the corridor of universities. Adequate water consumption for human is becoming a good habit and trend among people nowadays due to their awareness on importance of water in healthy life. Study of Gadelkareem et. al (2018) showed that the increase of the awareness about the importance of clean water, the economic growth in developing countries, and its properties such as portable size, affordable price promote to the steady expansion of global market of the water dispensers. There is also other primary aspect of water dispenser which cope to the needs of consumers especially Muslim which is halal certified.

Halal certification is one of the main aspects when it comes to Muslim consumption. Halal is considered as a huge factor to be tolerated by global Muslim population especially in the aspect of food and drink due to the halal security of products they consume in the daily life. In general, water dispenser category fall under consumer goods scheme, Malaysian Standard (MS) 2200-2: 2013 Islamic Consumer Goods-Part 2: Usage of Animal Bones, Skin and Hair-General Guidelines in halal certification by Department of Islamic Development Malaysia (JAKIM). Halal consumer goods is any products other than food and drink, cosmetics, pharmaceutical and medical devices. Referring to this Malaysian Standard, all materials used must be obtained from animal that is halal, slaughtered according to Shariah law as well as away from pig, dog and its derivatives. Aquatic bone from marine, river and other aquatic sources are also permissible to apply halal certification in consumer goods.

In Malaysia, various types of water dispensers are halal certified and mostly dominated by Korean established brands such as Coway and Cuckoo. There are also other water dispenser brands that already penetrated local market including SK Magic, Hijrah Tahirah and many more. In other words, halal certification has secured the halal status of water dispenser since auditing has been done by regulatory authorities to check each premises, factories, manpower, processes, and raw materials used from A to Z in regular basis. Halal supply chain must be integrally maintained from fark to fork until reach the consumer. In regards to halal water dispenser machine, all parts especially filtration media used must be halal certified or originated from halal sources.

Besides, one of the halal critical raw materials used in the making of water dispenser is the presence of activated carbon in the filtration system of water dispenser. Activated carbon is known as amorphous carbon-based materials that is prepared to possess an extended surface area and a high degree of porosity (Bansal & Goyal, 2005). It has been familiar as the oldest and widely used adsorbent for the water and wastewater treatment for removing organic and inorganic pollutants throughout the world. The presence oxygen, hydrogen, sulfur and nitrogen groups which are chemically bonded in the structure of activated carbon contribute to the unique adsorption properties and responsible for uptake of pollutants include carbonyl, carboxyl, lactones, phenols, quinones besides others. Nowadays, the concept of adsorption by activated carbon is currently employed in the drinking water treatment of water dispenser. In fact, activated carbon is becoming more versatile materials as it exhibits high surface area, large porosity, well developed internal pore structure consisting of micro, meso and macro pores as well as a wide spectrum of functional groups present on the surface (Kabir et. al, 2016) and effective in organic compounds removing than metals and other inorganic pollutants (Bhatnagar et. al, 2013).

Activated carbon is characterized by odorless, tasteless and black in colour. It is found in three main forms; granular activated carbon, powdered activated carbon, or pelleted activated carbon. Firstly, granular activated carbon (0.2 to 5 mm) and powdered activated carbon (less than 0.18 mm) are shaped in irregular and pulvaeized particles, respectively with the

similar use in liquid and gas phase applications. Pelleted activated carbon (4 mm), however, is in homogenized form as well as characterized by low pressure drop, high mechanical strength and low dust content suitable for only gas phase applications (NaturalTec, 2021). Additionally, the main aim of activated carbon in granular or powdered form in the early 1960s was the removal of taste and odor in water treatment (Kabir et. al, 2016). Other research show that granular activated carbon is effective in controlling the formation of chlorinated pollutants (Savchyna et. al, 2009), reducing the ozonation by-product (An et. al, 2008), bromate and adsorbing organic compounds, unpleasant taste and odors (Tanada & Boki, 1979). Due to its cost-efficiency and applicability in large scale drinking water treatment plants, granulated activated carbon is a well-established process for natural organic matter removal (Iriarte-Velasco et. al, 2008). For these reasons, granular activated carbon and powdered activated carbon become the most common filtering agents to make water drinkable or treat wastewater, mostly for the elimination of low molecular weight compounds.

The porosity of activated carbon serves as useful aspect in the filtration of contaminants from water, especially in water dispenser system. Other than porosity, large contact surface and high carbon power are important characteristic in choosing the raw materials of activated carbon for the best adsorption power. This porous substance can be obtained from variety of raw material sources; animal and plant-based as filtration media. In a study done by Mohammad-Khah and Ansari (2009), the production of active carbon can be obtained from various raw materials including animals, minerals and plants. According to Hassler and Cheremisinoff (1980), carbonaceous rich materials such as lignite, wood and coconut shell are common sources in the production of activated carbon. In fact, it is also manufactured from exclusive sources of vegetable origin and have high carbon power, such as agro-industrial residues, animal bones, chestnut hedgehog, coconut shell, mineral coal, olive stone, wood, among others (Alves et. al, 2021).

Common activated carbon used as filtration media in the water dispenser industry are produced from two types of animal bone; bovine and porcine sources. Some important criteria must be considered when it comes to bovine sources which are type animal used; either halal or non-halal animal and must undergo Islamic slaughtering method. In context of halal certification, it highlights the sources of raw material used either from halal or non-halal origin. Halal certified water dispenser must be equipped with activated carbon from halal bovine animal and slaughtered according to proper Islamic way.

Nonetheless, this issue become a very big concern as the supplier of animal bones are frequently coming from non-Muslim countries. In international level, Australia, China and Taiwan are named as favorite countries that manufacture animal bones for water dispenser. Animal bones from Australia are usually brought to Singapore for further process before exported again to other countries. Other than that, China is familiar with the largest pig industry country in the world. In regards of above issue, the use of animal bones raises doubt in halal status, especially among Muslim consumer. This is due to the facts that most materials of water dispenser in Malaysia are imported from China and Taiwan (Mohamad, 2015), creating a high possibility of animal bones to be taken from illegal or dubious sources. Based on a report by Aling (2020), almost 120 brands of water dispenser in Malaysia are doubtly of halal status and already sold in local market. This report might worsen the situation among Muslim consumer in Malaysia as those above listed water dispenser brands could be in their house or anywhere around them.

Carbon filter, membrane filter and sediment filter are among common filters that build the structure of filtration system in water dispenser. The type of filters used also can be varied among brands either local or international. In facts, all these filters must be maintained regularly so that the water dispenser functions as its intended purpose. In order to have a good quality of water, the company offer a complete package of owning brand new water dispenser

including free maintenance and service during a typical four to five years contract. Halal related issues raised when the contract ended and maintenance provider is no longer available. At the same time, consumer really need an adequate supply of clean and save water for daily consumption. As the contract ended, the free maintenance is terminated and must pay for every servicing visit. This additional payment, sometimes might be quite burden to the consumer as every visit will be charged up to hundreds ringgit. As a result, consumers take their own action to repair it by themselves and obtain the carbon filter from online shopping platform due to cheaper price. The trend of economic nowadays drive consumers to do-it-yourself (DIY) especially the ones with high technical skills. They can cut the budget of hiring maintenance personnel with their skill to replace the oldest carbon filter. However, the main issue here is the online shopping of unknown carbon filter as it is mostly derived from activated carbon of animal bones. The structure of all filters used in a local water dispenser as its filtration system are shown in Figure 1.

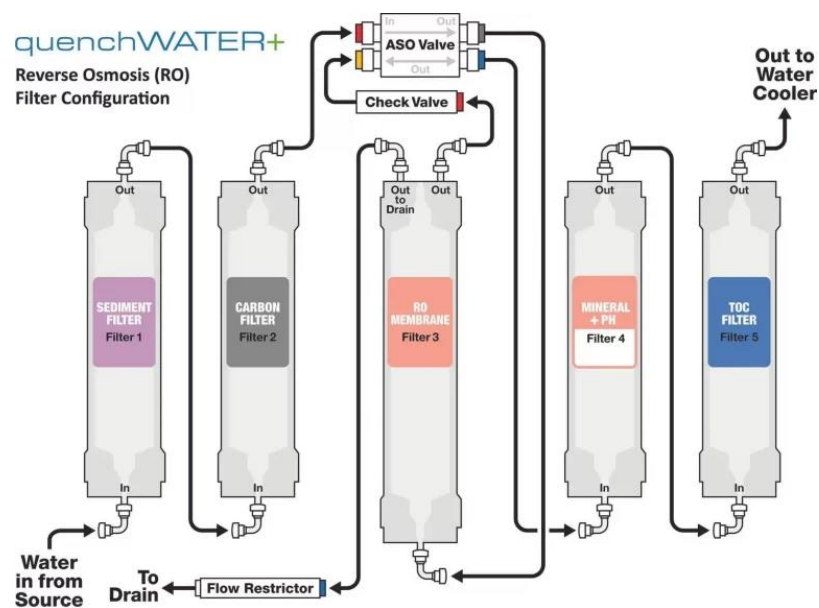


Figure 1: Error! No text of specified style in document.

Source:

<https://quenchwater.com/quenchwater-filtration/>

Online shopping is a form of electronic commerce whereby consumers directly purchase goods and services from a seller without an intermediary service over the internet using a web browser or a mobile app. The prevalence of online shopping platforms such as Alibaba, Amazon, Lazada, Shopee, and others are also exponentially growing. This fact is supported by John and Wichayachakorn (2019) that mentioned convenience become the most crucial factor that influences online shopping. Numerous products sold with different quality and price offered from the seller to shopper. With just a click of mouse, people find this platform the easiest and convenience way to purchase their goods, as well as compare and make proper choice to place order. In the order hand, this platform offer the most convenience way especially in monetary, time and energy. All these factors encourage and motivate people to purchase products online with the aid of online banking website and apps.

In contact of water dispenser, consumers can choose their own preference of obtaining carbon filter from variety of sellers over all products sold. Online shopping platform offers a wide variety of carbon filters from the cheapest to the highest price, and from the lowest quality to the best quality of products. The product specification of carbon filter is generally provided

and consumers can read the review of previous shoppers either positive or negative feedbacks, thus assisting in proper shopping decision.

In spite of the fact that various activated carbon filter products sold in the shopping platform, the concern here are more on unknown material especially derived from non-halal sources. Product specification of carbon filters sold is crucial for the status of the product either halal or non halal. It is usually shown or stated in the area of product details in the online shop. Halal logo become a benchmark in determining the product either halal certified or vice versa. At this point, selection of carbon filter is extremely critical because most consumers are usually ignorant about product specification, especially the material of activated carbon. Three criteria; price, quality and halal certified must be taken into consideration in purchasing carbon filters as part of filtration system in water dispenser. However, there is a case where the seller does not provide any product specification in the shop, thus driving difficulties for reference. Halal status of a product cannot be proven as there is no indication, symbol or logo shown. Searching for alternatives such as purchasing other brands of overall quality or surveying the similar brands in the other shop could be a good action. In addition, price is another influencing factor that could potentially put consumers in dilemma. This situation happens when a carbon filter with good feedbacks and cheaper price is recommended, however in the same time the product is not halal certified, absence of halal logo or made from non halal materials. Halal aspect must be on a top priority in considering one's purchase as it involves a question of permissibility and non-permissibility of the products. Both cheap price and good feedback are not necessarily good indicators to determine halal assurance of the carbon filter. A stand firm from consumer on choosing carbon filter must be not only rely on a product with cheaper price and good reviews, but the sign and indication of halal such as halal logo and other supporting product information are necessarily pivotal. In other words, all important criteria must be fulfilled to select and purchase carbon filter for the water dispenser in order to supply halal, clean and safe water. Hence, halal is the most antecedent element rather than good feedback and others; quality, fast delivery, and fast response in purchasing carbon filters. Halal certified water dispenser machine must be fully matched with halal carbon filters as a means to supply clean and safe drinking water for consumers, especially Muslim is assured.

3. CONCLUSION

In conclusion, halal certified carbon filter is one of the important elements in ensuring the halal status of water dispenser in order to have a continuous supply of halal, clean and safe drinking water. All influencing factors including price, quality, halal, review and feedbacks must be complementary to each other in purchasing activated carbon filters via online shopping platform. However, halal matters such as Halal logo and product specification must be highlighted as top priority rather than other matters in ensuring the supply of drinking water for daily consumption is halal, clean and safe.

REFERENCES

- Abtahi, M., Kamyar, Y., Mohebbi, M., Koulivand, A., Rafiee, M., Jahangiri-rad, M., . . . Oktaie, S. (2016). An innovative drinking water nutritional quality index (DWNQI) for assessing drinking water contribution to intakes of dietary elements: A national and sub-national study in Iran. *Ecological Indicators*, 60, 367-376.

- Aling, Y. D. (2020). *120 Penapis Tak Halal*. Harian Metro.
- Alves, A. T., Lasmar, D. J., Miranda, I. P., Chaar, J. d., & Reis, J. d. (2021). The potential of activated carbon in the treatment of water for human consumption, a study of the state of the art and its techniques used for its development. *Advances in Bioscience and Biotechnology*, *12*, 143-153.
- An, D., Song, J.-x., Le, L.-S., & Wang, W.-z. (2008). Competitive adsorption between bromine and bromate on activated carbon and impact on bromate formation. *Environmental Science*, *29*(4), 948-953.
- Bansal, R. P., & Goyal, M. (2005). Activated Carbon Adsorption. In C. Maxwell, *A Treatise on Electricity and Magnetism* (pp. 68-74). Boca Raton: CRC Press, Taylor & Francis Group.
- Bhatnagar, A., Hogland, W., Marques, M., & Sillanpää, M. (2013). An overview of the modification methods of activated carbon for its water treatment applications. *Chemical Engineering Journal*, *219*, 499-511.
- Dutra-de-Oliveira, J. E., & Nogueira de Almeida, C. A. (2002). Domestic Drinking Water—An Effective Way to Prevent Anemia among Low Socioeconomic Families in Brazil. *Food and Nutrition Bulletin*, *23*(3), 213-216.
- Farkas, A., Drăgan-Bularda, M., Ciatarâș, D., Bocoș, B., & Tigan, S. (2012). Opportunistic pathogens and faecal indicators in drinking water. *Journal of Water and Health*, *10*(3), 471-483.
- Gadelkareem, T. M., EldeinHussin, A. T., Hennes, G. M., & El-Ehwany, A. A. (2018). Stirling cycle for hot and cold drinking water dispenser. *International Journal of Refrigeration*, *99*, 126-137.
- Hassler, J. W., & Cheremisinoff, P. N. (1980). *Carbon Adsorption Handbook*. Ann Arbor: Ann Arbor Science.
- Iriarte-Velasco, U., A'lvarez-Urriarte, J. I., Chimeno-Alan' s, N., & Gonza'lez-Velasco, J. R. (2008). Natural organic matter adsorption onto granular activated carbons: implications in the molecular weight and disinfection byproducts formation. *Industrial & Engineering Chemistry Research*, *47*, 7868-7876.
- John, V. K., & Wichayachakorn, A. (2019). Penetration of eCommerce and Perception of Consumers in Thailand. *International Journal of Advanced Science and Technology*, *28*(8s), 364-375.
- Kabir, T., Hasan, M. S., & Das, P. (2016). Applicability of Activated Carbon Filtration in Surface Water Treatment. *Asian Journal of Innovative Research in Science, Engineering and Technology*, *1*(10), 1-6.

- Li, P., & Wu, J. (2019). Drinking Water Quality and Public Health. *Exposure and Health*, 11(2), 73-79.
- Mohamad, S. M. (2015). Temuramah Berhubung Produk Penapis Air Halal di Hijrah Water Sdn. Bhd. Tangkak, Johor.
- Mohammad-Khah, A., & Ansari, R. (2009). Activated charcoal; preparation, characterization and applications: a review article. *International Journal of ChemTech Research*, 1, 2745-2788.
- NaturalTec (2021). *Carvão Ativado—Ficha Técnica*. Retrieved from <https://www.naturaltec.com.br/carvao-ativado-ficha-tecnica/>
- Oasis International (2023). *Bottled Water Coolers*. Retrieved from <https://www.oasiscoolers.com/products/bottled-water-coolers.html>
- Quench (2023). *Quench Water Technology*. Retrieved from <https://quenchwater.com/quenchwater-filtration/>
- Savchyna, L. A., Kozyatnyk, I. P., Poliakova, T. V., & Klymenko, N. A. (2009). Influence of surface chemistry and structure of activated carbon on adsorption of fulvic acids from water solution. *Water Science & Technology*, 60(2), 441-447.
- Tanada, S., & Boki, K. (1979). Adsorption of various kinds of offensive odor substances on activated carbon and zeolite. *Bulletin of Environmental Contamination and Toxicology*, 23, 524-530.
- World Health Organization (2018). Drinking water. *World Health Organization Fact Sheets*. Retrieved from <https://www.who.int/en/news-room/fact-sheets/detail/drinking-water>