Halal Compliance on Drinking Water Industries: A Future Perspective

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1 Introduction

Water is an essential substance for a human being. In an Islamic perspective, clean water is important element particularly in purification of human body and for ablution purpose prior to performing salah (prayer). As a human being, Muslims too drink water for sustaining their life. At this point, consuming lawfully water is a crucial aspect for Muslims.

Shariah, as Islamic divine rule of law, puts water as a collective property for the people (Wibisono 2013). The term "collective property" is a unique positioning, differs from the term "commons property" as used by Hardin (1968). In terms of

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N. Muhammad Hashim et al. (eds.), *Proceedings of the 3rd International Halal Conference (INHAC 2016)*, https://doi.org/10.1007/978-981-10-7257-4_48

ownership, Prophet Muhammad pbuh saying: "*Muslims have [a] common share in three things: grass (pasture), water and fire (fuel)*" (Abu Dawood 3470). Anas narrated from Ibn 'Abbas adding, "*and its price is Haram (forbidden*)." Ibn Majah narrated from Abu Hurairah (ra) that the Prophet pbuh said: "*Three things are not prevented from (the people); the water, the pastures and the fire.*" This shows that people are partners in water, pastures, and fire, and that any individual (as a person or a corporate) is prohibited from possessing them. In the Islamic perspective, sovereignty belongs to the laws of Allah, i.e. the shariah, not the people. It is the chaliph who implements the sharia in the lands of Islam, as al-Mawardi states: 'Imamate is prescribed to succeed prophethood as a means of protecting the deen (Islam) and of managing the affairs of this world.' (Nugroho et al. 2013). Therefore, it is clear that under Islamic law, the rights to water belongs to the people and regulated by the state. The state is involved in regulating and monitoring water and water supply, with proper regulations governing this matter. Water is human basic needs, traditionally found easily when needed, abundance in nature and relatively free. However, in this free market economy, clean water is being traded as an economic commodity. This paper reviewed some aspects for Halal Toyyiban Critical Control Points in modern water supply and proposing a new perspective on halal compliance for drinking water industries.

2 Industrial Drinking Water

Industrial drinking water is traditionally provided in two forms: tap water and bottled water. Drinking water from tap usually found in developed countries, while bottled water mostly distributed in the least developed countries which are not able to provide good water distribution from drinking water treatment plant to every household.

2.1 Tap Water

The supply of good and reliable drinking water led to a significant improvement of public health. The treatment of water for drinking purposes is basically part of the technical setup in the public drinking water supply (see Fig. 1). Drinking water production consists of the abstraction of raw water, either groundwater or surface water, followed by physical or chemical treatment, in order to obtain clean and quality drinking water. In such area, there is a fine distribution network available; transporting water to the clients' houses which in most cases, connected to the distribution network that distributes drinking water to the different taps (Moel et al. 2006).

Typical unit operations for water treatment and its process sequence are described in Fig. 2. The complete unit of operation processes consists of depth filtration, surface filtration, microfiltration, ultrafiltration, nanofiltration, reverse

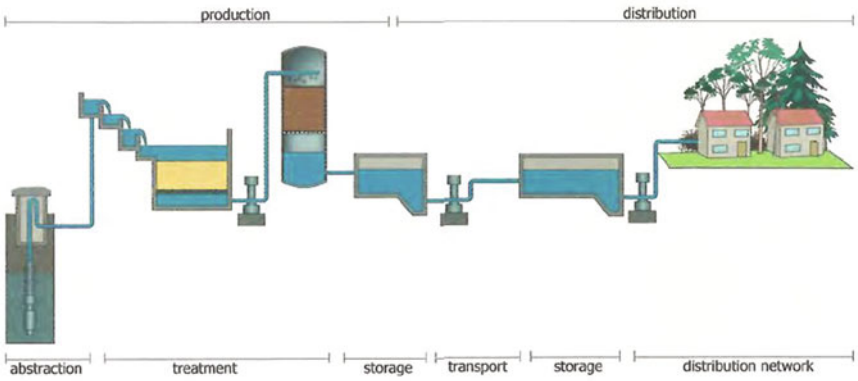

Fig. 1 Schematic of drinking water production (Moel et al. 2006)

osmosis, electrodialysis, carbon adsorption, ion exchange, advanced oxidation, and disinfection. Traditionally, water reuse normally involves secondary treatment with or without nutrient removal. By following those processes, major constituents found in raw water will be removed, for instance, suspended solids, colloidal solids, particulates from organic matter, dissolved organic matter, nitrogen, phosphorus, trace contaminants, total dissolved solids, protozoa cysts and oocysts, bacteria, and also viruses (Asano et al. 2007).

2.2 Bottled Water

Since 1990s, demand for bottled water as the alternative supply to tap water had increased significantly. Among non-alcoholic beverages, bottled water has become the fastest growing consumption per capita in many countries. Figure 3 shows the number of bottled water consumption in 2009 for some representative countries. The most significant number of bottled water consumption was recorded in the US and Latin America. In Asian countries, bottled water consumption was significantly high in China and Indonesia. On the other hand, less bottled consumption was observed in many European countries.

The growing interest in bottled water consumption reflects several hypotheses. It might show the dissatisfaction of people toward the usage of tap water organoleptics or the acceptance of users to have more choices in their consumptions. However, some scholars claim that the major factor that contributes to the significant increase in bottled water consumption is the risk posed by tap water due to health-related reason. It is also claimed that the increasing number of bottled water consumption in countries shown in Fig. 3 relates to problems with tap water qualities and sanitation level in those relevant countries (Doria 2006).

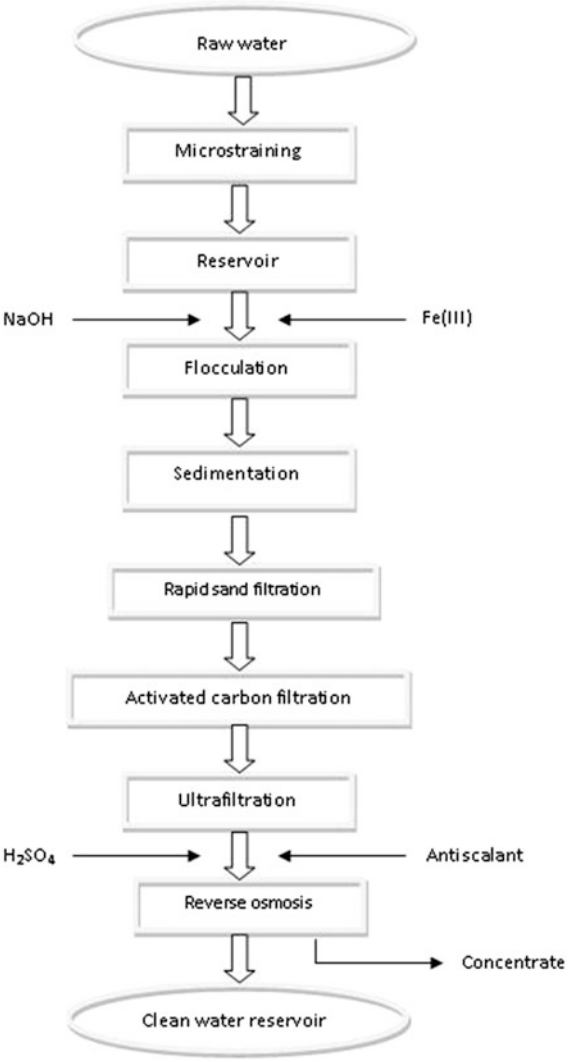

Fig. 2 Typical treatments in drinking water production plant

3 Halal Toyyiban Critical Control Points (HTCCP) of Drinking Water

In a normal production of drinking water, there are series of treatment to be followed. In such cases, product water is now considered as processed water and not in its raw form. Water in its raw form is considered halal and toyyiban in total, however, upon undergoing several processes, the nature of the product water may change due to the contact with foreign materials throughout the treatments. Therefore, it is important for Muslims to ensure the halal status of the water, in

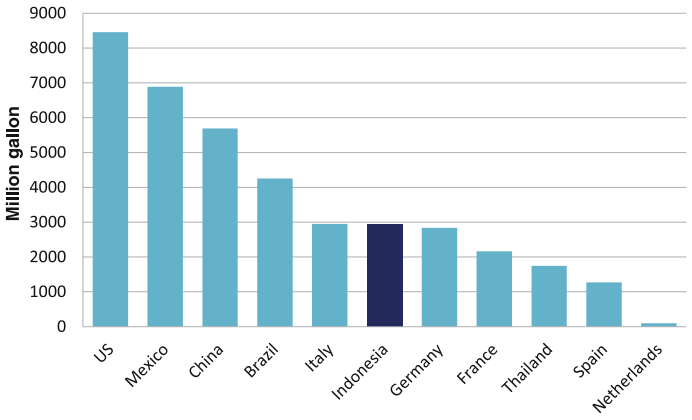

Fig. 3 Global consumption of bottled water in 2009 (FWS 2009; IBWA 2009)

order to confirm the existence of any material which might change the nature of the water. There are three locations in process line as shown in Fig. 1, which are critical to be examined in relation to halal and toyyiban aspects, i.e., point of source, point of treatment, and point of distribution.

3.1 Point of Source

For production of drinking water, there are three available resources from which its made: (a) fresh water, i.e., water containing only a limited amount of dissolved compound; (b) groundwater, i.e., porous underground aquifer which is isolated from contaminated upper soil (confined aquifer); and (c) surface water, commonly available in large amounts and easily abstracted as rivers and lakes (Moel et al. 2006).

As compared to other resources, the surface water requires extensive treatment process. The treatment aims to remove all physical contaminants, such as suspended solids and improve turbidity; chemical contaminants, such as toxic compounds and micropollutants; and biological contaminants like bacteria and pathogens.

In an urban area or overpopulated country, great increase in clean water for drinking was observed. Very limited access to fresh and groundwater led to the extensive use of surface water and wastewater. Unfortunately, the surface water is highly polluted by domestic and industrial waste streams. The water quality deteriorates by the presence of contaminants which could lead the water contains najasah (i.e., ritually unclean or filthy). Keeping surface water clean and inhibiting from najasah is important for Muslims.

It is clear that Islam gives special attention to the origin of water, which must be clean from all sort of contaminants. The issue arises is whether the status of the

water is considered permissible or not where it has been processed from an unknown source of water which might contain najasah. In such cases, its application must be scrutinized. The reuse water from sources such as sewage, treated effluent, toilet water indeed have some impacts on the purification aspect of Muslim consumers, not only due to the health factor, but also based on Islamic jurisprudence (Uddin et al. 2014; Ching 2010).

By reference to the concept of public interest (*maslaha*), some Muslim scholars viewed that wastewater may be appropriate for human use, if treated properly. Council of Leading Islamic Scholars in the Saudi Arabia, issued a fatwa in 1978, that stated: "Impure wastewater can be considered as pure water and similar to the original pure water, if it undergone several treatments using advanced technical procedures which is capable of removing impurities with regards to taste, colour and smell, as witnessed by honest, specialized and knowledgeable experts. Then it can be used for all purposes, including for drinking" (McIlwaine et al. 2010). Using modern technology, the removal of all extraneous impurities such as urine, feces etc., can be done and water restoration can be obtained to a very high degree of purity. However, it is important to consider the source of wastewater as it has a connection to the prohibition of utilizing *najasa* or *mutanajjis* water which needed more explanation from Islamic scholars and mufti.

3.2 Point of Treatment

The next point for Halal Toyyiban Critical Control Point of drinking water is during its treatment and preparation. Not surprisingly, current drinking water is produced via extensive treatment. As highlighted in Fig. 2, it can be concluded that at least two points are considered as Halal Toyyiban Critical Control Points, i.e., during flocculation and activated carbon processes.

During the process of flocculation, the chemicals are used extensively. These chemicals posed a potential threat to consumers' health. As for the use of activated carbon, there are extensive studies that propose the valorization of pig manure as good absorbers (Cantrell et al. 2012; Kuppens et al. 2014). The use of unlawful substance in the process of making drinking water could lead to producing unlawful products. In order to ensure the status of halal water can be preserved, the use of halal activated carbon in the treatment process for making drinking water is proposed. For example, DOW Company produces DOWEX ion exchange resin, which is not only accordance to the standard of the FDA, but also accepted based on Kosher and Halal Standard.

Most of the activated carbon producers have halal products. Table 1 summarizes the commercial activated carbons which are halal-certified. The data shown is mere to illustrate the concern of the producers in observing the halal standard, but it does not show the expiry status of the certification.

According to Wibisono et al. (2016), membrane technology is a novel yet well-established technology for drinking water treatment that complies with the

Table 1 Concise list of halal-certified activated carbons for drinking water treatment

No.	Brand Name/ Company	Country	Address/contact	Halal certification body	Type of activated carbon	Source of activated carbon
1	Philippine-Japan active carbon corporation (PJAC Corp.)	Philippines	www. pjac-corp.com	Islamic Da'wah Council of The Philippines	Granular, powdered	Coconut shell
2.	C. Gigantic Carbon Co., Ltd.	Thailand	www. cgc-carbon.com	The Central Islamic Committee of Thailand	Granular, powdered	Coconut shell, palm shell, eucalyptus wood
3.	PT Indokarbon Primajaya	Indonesia	www. inkacarbon-indonesia.com	The Indonesian Council of Ulama	Powdered	Coconut shell, wood
4.	PT. Ikaindo Industri Karbonik Indonesia	Indonesia	www.ikaindo.en.ec21.com	The Indonesian Council of Ulama	Powdered	Coconut shell
5.	Cocarb Solution	Denmark-Poland-Indonesia	www.cocarb.com	The Islamic Food and Nutrition Council of America	Granular, powdered	Coconut shell
6.	Concept Ecotech	Malaysia	www. conceptecotech.com	JAKIM Malaysia	Powdered	Coconut shell
7.	Cabot Norit (UK) Limited; Cabot GmbH Brands: Norit, Darco (halal products refer to each product certificate)	UK	www.cabotcorp.com	• The Muslim Food Board (UK) • The Islamic Food and Nutrition Council of America (IFANCA) • Halal Control (Germany)	Granular, Powdered, Extruded, Filter plates, Tablet, Capsules	Wood, peat, coconut shell

(continued)

Table 1 (continued)

No.	Brand Name/ Company	Country	Address/contact	Halal certification body	Type of activated carbon	Source of activated carbon
8.	Osaka Gas Chemicals Co. Ltd. Brand: Shirasagi	Japan	www.ogc.co.jp/shirasagi/e/	Japan Muslim Association—TSRI	Pelletized, Powdered, Fiber	Wood, coconut shell, coal
9.	Jacobi Carbon (part of Osaka Gas Chemicals)	Global, Sweden	www.jacobi.net	Halal Accreditation Council (Srilanka) All Ceylon Jamiyyathul Ulama (Srilanka)	Powdered, granular, extruded, spherical, felt cloth	Coconut Shell, bituminous coal, wood, lignite
10.	Calgon Carbon	US	www.calgoncarbon.com	The Islamic Food and Nutrition Council of America	Granular, Powdered, Pelletized	Pinewood, coconut shell
11.	CarboTech AC GmbH	Germany	www.carbotech.de	European Institute of Halal Certification (EHZ)	Powdered, granular, extruded	Wood, bituminous coal, coconut shell, hard coal
12.	Fujian Yuanli Active Carbon Co., Ltd.	China	www.yuanlicarbon.com	The Indonesian Council of Ulama	Powdered	Wood
13.	Shanxi Xinhui Activated Carbon Co., Ltd.	China	www.xinhuicarbon.com	The Islamic Food and Nutrition Council of America	Powdered, granular, extruded	Coal
14.	Manek Active Clay Pvt. Ltd.	India	www.manekactiveclay.com	Halal Committee of Jamiat-E-Ulama-E-Hind Maharasthrain State	Powdered, granular	Not stated
15.	Hotai Industrial Co. Ltd	Taiwan	www.activated-carbon.com.tw	The Islamic Food and Nutrition Council of America	Not stated	Not stated

halal standard. Membrane technology is being used for desalination of seawater or brackish water (reverse osmosis), separation of sulphate or reduction of the concentration of hard water forming components in drinking water (nanofiltration), improved purification of river water (ultrafiltration), and disinfection of water from dams and reservoirs (ultrafiltration) (Peters 2010).

3.3 Point of Distribution

At the distribution point of tap water, leakage is also critical to human health. The contamination of bacteria or other pathogen is critical with regards to *toyyiban* aspect of drinking water. New technologies for controlling the leakage, has been studied than applied in many developed countries.

As for bottled water, trace chemicals found in bottled water are also critical to be scrutinized, whether the bottle used for drinking water provide *toyyiban* factor for Muslim consumers. Several studies revealed that bottled water contains some chemicals which might worsen consumers' health, such as endocrine-disrupting chemicals and antimony (Misund et al. 1999; Shotyk et al. 2006; Snyder et al. 2005; Wagner and Oehlmann 2009).

4 Conclusion

In nature, water is halal and can be used as purifying substance. However, in this modern and capitalistic era, water resources are depleting and its quality is deteriorating by the presences of many pollutants, which restrict the consumption of water for Muslims. It is therefore, this paper would like to emphasize the importance of having and following proper guidelines namely Halal Toyyiban Critical Control Points with regards to processing bottled drinking water. The use of chemicals or substances, as well as the activated carbons during the treatment, should meet and comply with the requirement in halal standard. It is also suggested that membrane technology to be used to replace activated carbon technology in the treatment of such bottled drinking water.

References

Asano, T., Burton, F., Leverenz, H., Tsuchihashi, R. Tchobanoglous, G. (2007) *Water reuse: Issues, technologies, and applications: Issues, technologies, and applications*. Mcgraw-hill.

Cantrell, K. B., Hunt, P. G., Uchimiya, M., Novak, J. M., & Ro, K. S. (2012). Impact of pyrolysis temperature and manure source on physicochemical characteristics of biochar. *Bioresource Technology, 107,* 419–428.

Ching, L. (2010). Eliminating 'yuck': A simple exposition of media and social change in water reuse policies. *International Journal of Water Resources Development, 26*(1), 111–124.

Doria, M. F. (2006). Bottled water versus tap water: understanding consumers' preferences. *Journal of Water and Health, 4*(2), 271–276.

FWS. (2009). *Kerngegevens 2009, FWS*. Sappen: Nederlandse Frisdranken, Waters.

Hardin, G. (1968). The Tragedy of the Commons. *Science, 162*(3859), 1243–1248.

IBWA. (2009). 2009 Market Report Findings: Bottled Water Reporter, IBWA International Bottled Water Association.

Kuppens, T., Van Dael, M., Vanreppelen, K., Carleer, R., Yperman, J., Schreurs, S., et al. (2014). *Techno-economic assessment of pyrolysis char production and application-a review* (pp. 67–72).

McIlwaine, S., Redwood, M., I.D.R. Centre. (2010). *Greywater use in the Middle East: technical, social, economic and policy issues*. Practical Action Pub.

Misund, A., Frengstad, B., Siewers, U., & Reimann, C. (1999). Variation of 66 elements in European bottled mineral waters. *Science of the Total Environment, 243–244,* 21–41.

Moel, P. J., Verbeck, J. Q. J. C., & van Dijk, J. C. (2006). *Drinking water: principles and practices*. Singapore: World Scientific.

Nugroho, W., Nugraha, R., & Wibisono, Y. (2013). Autonomous Framework on Governing Water for Sustainable Food and Energy (p. 37). Proceeding of Sharia Economics Conference, Hannover.

Peters, T. (2010). Membrane technology for water treatment. *Chemical Engineering and Technology, 33*(8), 1233–1240.

Shotyk, W., Krachler, M., & Chen, B. (2006). Contamination of Canadian and European bottled waters with antimony from PET containers. *Journal of Environmental Monitoring, 8*(2), 288–292.

Snyder, S. A., Vanderford, B. J., & Rexing, D. J. (2005). Trace analysis of bromate, chlorate, iodate, and perchlorate in natural and bottled waters. *Environmental Science and Technology, 39*(12), 4586–4593.

Uddin, S. M. N., Muhandiki, V. S., Sakai, A., Al Mamun, A., & Hridi, S. M. (2014). Socio-cultural acceptance of appropriate technology: Identifying and prioritizing barriers for widespread use of the urine diversion toilets in rural Muslim communities of Bangladesh. *Technology in Society, 38,* 32–39.

Wagner, M., & Oehlmann, J. (2009). Endocrine disruptors in bottled mineral water: Total estrogenic burden and migration from plastic bottles. *Environmental Science and Pollution Research, 16*(3), 278–286.

Wibisono, Y. (2013). Tragedi lumpur Lapindo: akar masalah dan solusinya. *Al Wa'ie*, 6, 74.

Wibisono, Y., Ahmad, F., Cornelissen, E., Kemperman, A., & Nijmeijer, K. (2016). Dominant factors controlling the efficiency of two-phase flow cleaning in spiral-wound membrane elements. *Desalination and Water Treatment, 57*(38), 17625–17636.