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Sanitation Knowledge and Practices of Malaysian Food SMEs: Addressing Current Issues and Readiness in Acceptance of Green Sanitation Technology

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***Abstract*— Sanitation is crucial in the food industry, involving cleaning and disinfection processes to ensure facility cleanliness. This study examined sanitation knowledge and practices among small and medium enterprises (SMEs) in Malaysia's frozen meat sector. It also evaluated the acceptance of eco-friendly sanitation technology, specifically an electrolysis unit producing electrolyzed water. Data was collected through an open-ended online questionnaire using Google Forms. The questionnaire comprises demographic profiles, sanitation knowledge, sanitation program design knowledge, sanitation challenges, and the acceptance of integrating a green cleaner with the current sanitation program. Results show SME manufacturers possess sanitation knowledge but face implementation challenges due to absent sanitation programs, skilled labor shortage, hot water supply issues, difficulty cleaning narrow spaces in equipment, chemical storage, and budget constraints. Due to low-temperature operations, only 73 % of frozen meat industries use hot water for sanitation. Additionally, 45 % lack wastewater treatment, leading to chemical residue discharge into municipal drainage. SMEs show interest in electrolyzed water for its dual role as a cleaning and disinfecting agent. The technology's room-temperature efficacy and environmentally friendly degradation into salt and water appeal to SMEs. Adopting electrolysis sanitation technology is expected to significantly reduce costs by utilizing only salt, water, and electricity for electrolyzed water generation.**

***Keywords*—Food safety; cleaning awareness; sustainability; green sanitation; knowledge management acceptance; knowledge management readiness.**

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I. INTRODUCTION

The food industry in Malaysia is currently undergoing significant expansion. According to a report by the Department of Statistics Malaysia (DOS) in 2011, out of a total of 37,861 SMEs in the manufacturing sector, 6,016 are engaged in producing and manufacturing food and beverage products [1]. However, the number of food and beverage manufacturers complying with Hazard Analysis Critical Control Point (HACCP) and Good Manufacturing Practice (GMP) standards is less than 500, as reported by the Food Safety and Quality Division of Malaysia in 2014 [1]. This highlights the low level of compliance with food safety and hygiene standards among the Malaysian food and beverage industries. HACCP and GMP are globally recognized programs for ensuring food safety. However, obtaining certifications remains a significant challenge for Malaysian SMEs. These SMEs encounter various obstacles when attempting to implement the GMP and HACCP. These challenges stem from issues like inadequate factory layout design, limited access to and knowledge of current sanitation technology, and limited allocation of resources for sanitation programs [1–4]. The limited space in the production area presents a constraint for food SMEs, leaving little room for

sanitation activities involving cleaning and disinfection. This space is essential for disassembling food processing equipment and facilitating the efficient use of cleaning tools (e.g., water jet, broom, brushes, and mop) during the cleaning process. Food SMEs often rely heavily on external expertise to develop sanitation programs. This assistance comes from vendors, government agencies, research institutes, and universities [5]. It is important to note that each food factory faces unique sanitation challenges. Unquestioningly, adhering to a generic sanitation program can result in insufficient or excessive cleaning practices [6]. To ensure compliance with the GMP and HACCP, it becomes imperative to investigate the sanitation problems and challenges specific to food SMEs.

A well-structured and systematic sanitation program guarantees food safety [5, 7, 8]. Within the food industry, implementing a sanitation program is mandatory to ensure the continuous maintenance of safe food production (Regulation 9: Food safety assurance program, Food Hygiene Regulation 2009, enacted under Section 34 of Food Act 1983 in Malaysia). Sanitation programs for food-contact surfaces act as preventive controls to prevent the hazard identified during the hazard analysis (Section 103: Hazard Analysis and Risk-based Preventive Controls, part of Food Safety Modernization Act (FSMA) administered by the Food and Drug Administration (FDA) in the USA). It is a primary legal responsibility of a food business operator to establish a secure system to ensure food safety during the supply of food (Regulation (EC) No. 178/2002 of the European Parliament and the Council, part of the General Food Law Regulation overseen by European Food Safety Authority (EFSA) in Europe).

A good sanitation program comprises eight fundamental steps, which include: 1) the removal of large debris, 2) pre-rinse with water (preferably warm or hot), 3) application of detergent, 4) an intermediate wash phase (to eliminate detergent residues), 5) an optional detergent wash, 6) another intermediate wash, 7) disinfection, and 8) an optional final rinse [7], [8]. These sanitation steps should be executed for an open system manufacturing setup using appropriate cleaning tools such as brushes, sponges, brooms, water jets, and the like, along with suitable detergents [6, 7]. However, it's worth noting that procuring cleaning chemicals can incur significant costs for food SMEs, as these enterprises usually operate under constrained sanitation budgets [2].

An eco-friendly alternative for sanitation, such as electrolyzed water (EW), holds significant promise for integration within Malaysian food SMEs [2]. EW, both cost-effective and environmentally friendly, presents the opportunity to replace multiple cleaning chemicals typically needed for different sanitation steps [3, 9–11]. This concept is shown in Fig. 1. EW serves a dual role: it acts as a cleaning agent for items such as medical equipment [12], food-contact surfaces such as stainless steel [13–17], glass [18], cutting boards [19], non-food contact surfaces such as tiles [19, 20], gloves [20] and even laundry [21], while also serving as a disinfectant. The production of the EW can be achieved through either batch-type or continuous-type processes. EW generation can be achieved using stationary or portable EW generators [3]. Incorporating EW as a sanitation medium aligns well with the needs of food SMEs, offering an ideal solution. However, further investigation is needed to optimize its implementation to determine the suitable EW generator size, portability, and capacity.

In a previous study conducted by Khalid et al. [2], a case study was undertaken at a frozen SME factory in Malaysia. The focal points of the investigation encompassed both group discussions (meetings) and individual reflections gathered from employees at various hierarchical levels through face-to-face, unconstructed, and impromptu interviews conducted during a factory visit. The primary subjects of these interactions revolved around the challenges encountered during sanitation practices and the readiness of food SMEs to embrace environmentally friendly cleaning and disinfectant solutions. The results show four fundamental problems: difficulty selecting appropriate cleaning chemicals, limited knowledge of the cleaning and disinfection protocols, limited budgets allocated for the sanitation processes, and inadequate storage space. However, the study revealed a considerable desire among participants to invest in alternative, cost-efficient, and effective cleaners and disinfectants if such options were made accessible.

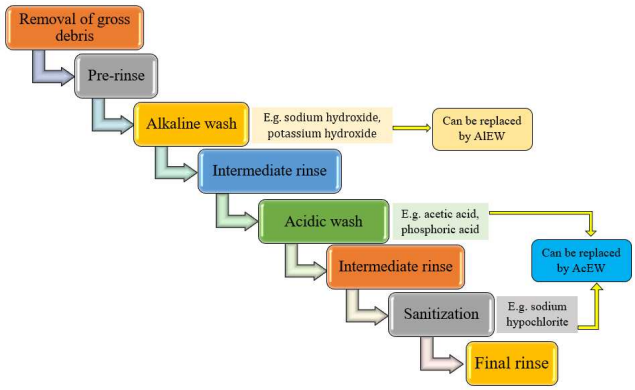

Fig. 1 Sanitation steps in the food industry

AlEW is Alkaline electrolyzed water, and AcEW is acidic electrolyzed water. Based on Khalid et al. [2] findings, EW emerges as a sustainable and environmentally friendly cleansing agent. The incorporation within food SMEs is relatively cheap as it solely uses NaCl and water. EW can be conveniently generated on-site, requiring minimal storage area for the EW generator and not requiring wastewater treatment. EW will revert to its initial state upon contact with organic substances, tap water, distilled water, or osmosis water [22–24]. Moreover, based on the findings from Khalid et al. [7], it is apparent that effective cleaning for a frozen meat patties SME factory can be achieved using a portable hot water jet in conjunction with appropriate industrial cleaning tools (e.g., industrial cleaning brushes).

Therefore, as an extension of the study conducted by Khalid et al. [2, 7], the objective of this paper is to highlight: 1) the current sanitation knowledge and practices among SME manufacturers at selected food frozen factories in Selangor, Malaysia; 2) the challenges or restrictions during sanitation that prevent food SMEs from achieving adequate sanitation; and 3) to identify the acceptance of Malaysian food SMEs towards electrolysis sanitation device.

Malaysian food SMEs' current knowledge and practices were administered using a survey approach on 11 frozen meat SMEs in Malaysia. The research findings offer insights into

SMEs' readiness to accept green sanitation technology, focusing on using electrolysis sanitation devices as examined in this study.

II. Material And Method

A. Investigation of Sanitation Barriers of Malaysian Food SMEs

This qualitative research aims to understand the sanitation problem from the perspectives of food SME manufacturers and find a solution. Information about food SME manufacturers' values, opinions, and behaviors can be obtained from this market survey. This market survey includes an open-ended questionnaire, allowing the respondent to express themselves in detail and be free to respond in their own words. Therefore, it enables the researchers to understand everyone's perspective clearly.

B. Instrument

The instrument used in this study is an open-ended online questionnaire developed based on findings from a case study by Khalid et al. [2]. Both Yes/No questions and WH-questions (what, when, where, who, whom, which, whose, why, and how) were used in the online questionnaire. The WH question has been developed in the questionnaire to gather all the factory's information, understanding, and opinions. Fig. 2 summarizes the content of the online questionnaire.

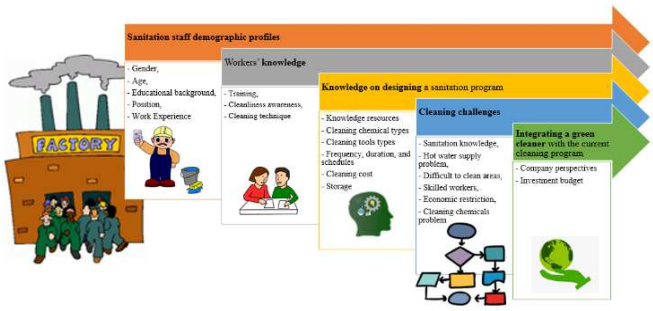

Fig. 2 Online questionnaire contents.

Initially, the investigation entails a comprehensive assessment of demographic profiles attributed to individuals responsible for overseeing the sanitation process within frozen food SMEs. Parameters such as gender, age, educational background, the respondents' post in the company, and work experience were considered.

Next, the questionnaire for sanitation knowledge focused on workers' knowledge and practices related to the current sanitation program in their factory. It also includes the quantity of training attended by workers, cleanliness awareness (physically, microbiologically, and chemically clean equipment and environment), awareness of the importance of cleaning tools (brushes, brooms, water jets), and hot water cleaning.

Then, participants were asked about the sources they referenced to design their sanitation programs, with options encompassing 1) utilization of other companies' sanitation programs as benchmarks, 2) reliance on literature reviews (e.g., journals, articles, and books), or 3) seeking recommendations from machinery manufacturers. This is followed by inquiries concerning the types of cleaning chemicals and cleaning tools that they use. Additionally, participants are queried regarding their awareness of food-grade cleaning chemicals. The sanitation process's frequency, duration, and schedules were also explored. The sanitation chemicals and raw materials storage were also investigated to determine whether the storage area was the same or separated. Moreover, participants were also asked if they were aware of ongoing sanitation trends within the food industry, along with insights into their company's financial allocation for sanitation programs.

Subsequently, information on sanitation challenges or restrictions faced by SME frozen food manufacturers was gathered. Some of the obstacles were listed to assist respondents in answering this part, such as 1) lack of sanitation knowledge, 2) hot water supply problem, 3) the difficulties in accessing difficult-to-clean areas, 4) lack of skilled workers to perform sanitation, 5) economic restriction, and 6) cleaning chemicals problem. Respondents can also add any other challenges that they find relevant.

In conclusion, the questionnaire was focused on food SMEs' criteria for selecting the cleaning chemicals, their perspective on green cleaners, and their consideration of investing in green cleaners. The green cleaner is expected to be generated on-site, does not require a chemical storage area, and only needs sodium chloride (NaCl) and water as raw materials. However, they must make an initial investment to purchase the electrolysis sanitation device. Finally, is the amount these food SMEs are willing to invest in the potential electrolysis sanitation device. This device is expected to solve most sanitation challenges in food SMEs.

C. Data Collections Procedure

The data collection was done through an open-ended online questionnaire via Google Forms. In the first part of the Google Forms, there was a reminder for the respondents to contact us directly if they faced any difficulties in responding to the questions. The respondents were encouraged to answer honestly, and the confidentiality of the responses would not be leaked to a third party. The data obtained from the open-ended online questionnaire were then tabulated, categorized, and analyzed.

This study's target market is Malaysia's SME frozen food industry. Fig. 3 shows the data collection procedure in this study. Firstly, a list of SMEs in the frozen food industry was generated to recruit potential respondents. The list was built up based on information gained from 3 different channels, which are 1) data from SME Corporation Malaysia, 2) data from hypermarkets, and 3) data from the food festival fair. The registered frozen food industry list under SME Corporation Malaysia was obtained by sending an official request via email. Each datum was charged RM 10 per company. Ultimately, contact information, including company names, official email addresses, physical addresses, official Facebook pages, and phone numbers, was gathered from ten companies using this method.

A visit to one of Malaysia's major hypermarket chains, Mydin, was conducted to enlarge our sample. Mydin has a wide range of frozen products, such as burger patties, sausage, and ground beef. The contact details were determined from the product packaging. This initiative yielded information from 19 different companies. Lastly, participation in the Halal

Festival (Halfest), recognized as Malaysia's largest Halal Consumer Expo, proved instrumental. More than 500 booths of Halal products and services were showcased in the Halfest. Usually, Halfest provides the platform for the small-medium food industry to introduce their product and make it well-known to enter the new industries market Halfest [25]. Details of 19 companies were collected from this event. Mydin and Halfest were included in this project because both platforms allow food SMEs in Malaysia to market and sell their product regardless of their status in SMECorp. In total, details of 48 SME food-frozen companies were obtained.

Correspondence was initiated via email with these 48 companies. However, some of these emails are not valid. Thus, the official Facebook account was contacted through Facebook Messenger. Respondents were given three weeks to complete the open-ended online questionnaire. After one week, a reminder email or message was delivered to them via email or Facebook Messenger. After two weeks, a second reminder was delivered. The data collection process ended after three weeks.

D. Sample

The instrument used in this study is an open-ended online questionnaire. This study has successfully recruited 11 respondents using the generated list. The respondents supervise the sanitation process in the SME frozen food manufacturers in Selangor, Malaysia. The respondents were informed that the purpose of the study was to explore the knowledge and practices of sanitation in food SMEs and simultaneously validate the market opportunity of the electrolysis sanitation device in Malaysian food SMEs. It was also explained to the respondents that participating in this study is optional.

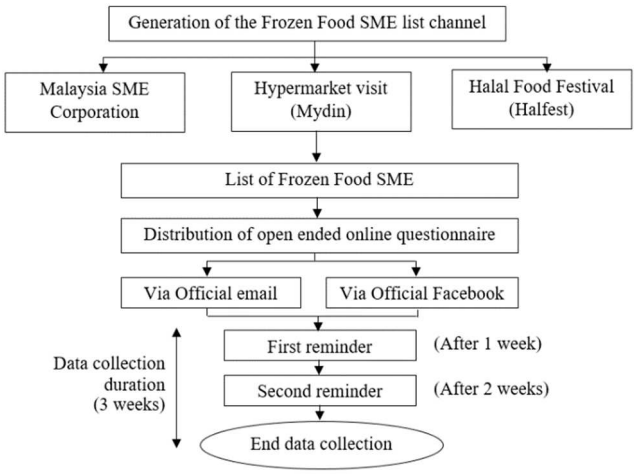

Fig. 3 The data collection procedures.

III. Result And Discussion

A. Demographic Profiles

The demographic data are shown in Table 1. 64 % of the respondents were female, and the majority were 30-39 years old. Most of them are experienced in working as Quality Assurance (QA) Executive and Quality Control (QC) Executives, while the others work as operators, engineers, continuous improvement leaders, and directors. 46 % of the respondents have worked in the food industry for over five years. All the respondents have finished their tertiary level of education. Specifically, almost 64 % of respondents have a diploma or bachelor's degree, while 36 % have a master's or Ph.D. Thus, it shows that most of the respondents who participated in this survey have a high education level.

B. Knowledge of the Sanitation Program

The knowledge and training are necessary for the food industry workers to ensure they can practice the best way to handle sanitation tasks [26–28]. Based on the data collected, most of the respondents working in the food SMEs have an excellent knowledge of sanitation. To have excellent hygienic practices, workers should attend any training related to the sanitation program. This was highlighted in the survey question to know whether the company provides sanitation training for every worker. 55 % of the respondents have attended external sanitation training. However, all the respondents make sure that their production workers go to sanitation training, whether in-house training (82 %) or external training (18 %), but this only applies at the beginning of the company's establishment. The result shows that most companies (SMEs) have provided in-house training as it is the most cost-effective option for training methods as there are no travel expenses or course expenditures. The new workers only rely on the training provided by the senior or experienced workers.

TABLE I
DEMOGRAPHIC PROFILE OF RESPONDENTS

Profile	**Respondent**	
	N =11	**(%)**
Gender		
• Female	7	64
• Male	4	36
Age		
• 20-29	4	36
• 30-39	5	46
• 40-49	2	18
Education		
• High school graduate	-	-
• Bachelor's degree	7	64
• Master/Ph.D.	4	36
Post of respondent		
• Operator	1	9
• Engineer	2	18
• QA	3	27
• QC	3	27
• Other	2	18
Work experience		
• Less than one year	4	36
• 1-5 years	2	18
• More than five years	5	46

Moreover, only 64 % of the companies provide annual sanitation training. Sanitation training is crucial to ensure that workers do the sanitation process correctly to achieve the desired level of cleanliness. The level of cleanliness can be divided into physical [29], chemical [8], and microbiological [17, 30, 31]. The result shows that all the respondents know and understand all the cleanliness levels. To validate their statement, participants were asked to elaborate on their perceptions of these cleanliness levels to support their claims.

All written responses show that they are experts in sanitation for their factory (as summarized in Table 2). They also added that they understand that achieving this level of cleanliness is to ensure food safety and achieve food hygiene standards.

All respondents knew and used cleaning tools (e.g., brushes, wipes, disposable towels, brooms, mops, and water jets) (as shown in Table 3). Hot water rinse helps melt the fat-based fouling deposit and ease cleaning. Thus, it is very crucial in the frozen food industry. All respondents know they must use hot water rinse to eliminate the fat layer on the food-contact surfaces. Hot water melted the fat layer and reduced the adhesiveness between the fat layer and the food equipment surfaces. As the fat layer melts, removal of the fat layer from the equipment surface is more straightforward. They also know the function of hot water rinsing. They stated that hot water rinse could remove food soil (e.g., fat, oil stains) and eventually kill any microorganisms accumulated on food-contact surfaces. Foodborne pathogens can be disinfected at high water temperatures without the help of cleaning chemicals [32–34].

TABLE II
UNDERSTANDING OF CLEANLINESS

Level of cleanliness	Summary of responses from respondents
Physical	• "Physically clean" means the food contact surfaces are free from physical dirt and deposits. • Cleaning tools are essential to clean any physical contamination such as food residues, dirt, etc.
Chemical	• "Chemically clean" means the food contact surfaces are free from chemicals used for cleaning. • After cleaning, toxic and acidity tests are needed to ensure that the food produced for each batch is safe from chemical residues for consumers.
Microbiological	• "Microbiologically clean" means the food contact surfaces are free from possible microbes. • It can be determined using a swab test. • It is vital to prevent any growth of microorganisms. • The microorganism can cause cross-contamination with food products.

Moreover, one of the respondents also added that hot water is essential to ensure cleaning chemicals react efficiently during cleaning. A chemical reaction is dependent on the cleaning temperature. Higher temperatures enhance chemical diffusion and increase the chemical reaction rate [8, 35–37]. However, only 73 % of the respondents used hot water for sanitation. The rest do not use hot water because they want to avoid boiler utilization as it can increase the operating and maintenance costs.

C. Knowledge of Designing an Efficient Sanitation Program

All the respondents have excellent knowledge of the sanitation program. Then, the questionnaire assessed their knowledge of implementing the factory's sanitation program. Table 3 also summarizes the respondents' knowledge on designing an efficient sanitation program, which involved four main elements which are 1) cleaning chemicals, 2) cleaning tools, 3) cleaning schedule, and 4) storage area for cleaning chemicals and cleaning tools. 91 % of the factories have sanitation schedules and have developed sanitation operation procedures. While the rest (9 %) only clean when they find it necessary. In designing the cleaning program, 64 % of the respondents followed the sanitation program from other companies with similar product types.

In contrast, 36 % of respondents tend to study their food processing and establish sanitation programs independently. Understanding the sanitation process and food processing equipment used to avoid excessive or less cleaning is crucial. Excessive cleaning will waste money and prolong downtime. On the other hand, inadequate cleaning will result in a degree of cleanliness that is not up to par.

Many respondents (55 %) do not know the monthly sanitation cost. One of the respondents stated that the cleaning chemical cost could be less than RM 300 monthly. On the other hand, other respondents noted that the total sanitation cost could be RM 3,000 monthly. 55 % of the factories have and have used wastewater treatment plants. The other 45 % do not have a wastewater treatment plant. Thus, the cleaning chemical is discharged to the drainage without any treatment. This will cause pollution of the environment.

D. Challenges/Restrictions during Sanitation

Six main challenges were identified during the sanitation for food SMEs: 1) not having a proper sanitation program, 2) lack of sanitation knowledge among the production workers (lack of skilled workers), 3) no hot water supply, 4) problems in accessing the difficult area in the equipment, 5) economic restriction, and 6) lack of cleaning chemical storage. All respondents admitted that their factories do not have a good sanitation program. Even though they know about sanitation, it is hard to implement an appropriate and efficient sanitation program. The production workers lack knowledge about sanitation. Not all production workers were allowed to attend any sanitation training or awareness program (as mentioned in Section B (under Result and Discussion)). Some of the production workers do not know that cleaning must be physically (free from food residue and debris), chemically (free from cleaning chemicals), and microbiologically (free from any foodborne pathogens) clean. Most production workers can roughly understand the concepts of physical and chemical cleanliness. In determining clean equipment, workers usually used their visual senses to examine the physical dirt and their touch senses to detect the chemical and fat residue.

However, it is tough for production workers to understand the microbiologically clean concept. They do not know anything about the swab test which needs to be performed for cleaning validation. They assume that anything they cannot see, and touch is irrelevant. Thus, microbiological cleanliness is often neglected in food SMEs. Sometimes, workers do not wear their PPE correctly, which leads to cross-contamination. Moreover, workers tend to get injured easily due to the lack of awareness. From the top management perspective, ensuring all the workers receive proper training is hard as the turnover is too high.

TABLE III
KNOWLEDGE OF DESIGNING AN EFFICIENT SANITATION PROGRAM

Question	Information
Cleaning chemical	• 73 % of respondents know the type of cleaning chemicals they use. For instance, alkaline, acidic, or formulated detergents. • 27 % do not know what type of cleaning chemical they use. • Food-grade cleaning chemical is rinseable. Thus, it will avoid any chemical residue after cleaning. • Only 73 % of respondents know the existence of this type of chemical. • 64 % of the respondents are alert and know about the latest efficient cleaning chemicals available on the market.
Cleaning tools	• All respondents used cleaning tools—for instance, brushes, sponges, squeegees, and brooms. • 82 % used water jets as cleaning tools. • 64 % of the respondents are alert and know about the latest efficient cleaning tools available on the market.
Cleaning schedule	• Cleaning was performed daily for all the factories. • The frequency can be different for each factory. • For a company that only produced a batch product per day, cleaning was performed once or twice per day. • Factories that produce several batches of product daily would perform cleaning after each batch. • The duration is also different. Cleaning can take less than 1 hour or longer (more than 2 hours). • It all depends on the size of the food processing equipment, hygienic design of the equipment (equipment without hygienic design is harder to clean as it has a more difficult-to-access area), size of the production area, and workers' sanitation skills.
Storage area for cleaning chemicals and cleaning tools	• 81 % of the respondents store the cleaning chemicals and tools separately from the raw materials in the storeroom. • While the other 9 % are stored in the same space as the raw material. • Cross-contamination could happen to the food products when the same area is used to store other items than the raw material.

Hot water supply is one of the challenges food SMEs faces during cleaning. As described in Section B (under Result and Discussion), hot water is essential to melt the fat layer on the surface of the equipment. Due to budget constraints, it is tough for food SMEs to purchase any sanitation machine that can produce hot water. In addition, difficulties in accessing the difficult clean area in the equipment also contribute to a big problem for SMEs to perform cleaning duty—for instance, challenges in cleaning deep tanks (e.g., mixer). Most food processing equipment in food SMEs does not have a standard hygienic design. Thus, manual cleaning is common for food SMEs. A ladder was used during cleaning. However, back injury could happen as the workers need to bend down (bad position) to clean the edge of the tank.

Moreover, they could fall easily from the ladder if safety measures were not taken. Most meat processing machines have sharp blades (e.g., mixer and mincer). Workers are exposed to sharp machine parts without proper PPE and cleaning tools. One of the respondents stated that they only used a kitchen sponge to clean the sharp blade. Therefore, appropriate cleaning tools are essential to reduce occupational injuries.

Food SMEs were also facing a problem storing the cleaning chemicals. 64 % of the respondents stated they do not have a specific storage room for cleaning chemicals. Thus, they keep their cleaning chemical in the same storage room as the dry raw material. Sometimes, they must hold the cleaning chemical in the hallway as the storage room is fully loaded. The previous study by Khalid et al. [3] also mentioned that disposing of expired cleaning chemicals is costly. Thus, food SMEs tend to store expired chemicals. Moreover, 45 % of the respondents do not have wastewater treatment.

Finally, is the economic restriction. Most of the problems above could be solved if they have extra money to spend. One respondent said they would rather spend the extra money on raw materials than sanitation programs. 55 % find the consultancy fee to design the sanitation program expensive. 45 % of the respondents also stated they could not afford food-grade cleaning chemicals and tools.

E. The Acceptance Level of Integrating a Green Cleaner with the Current Sanitation Program

EW, a promising novel cleaning medium and disinfection agent, should be proposed as an alternative to the conventional sanitation agent. EW can be generated on-site. EW does not require a storage area, does not require wastewater treatment, and is cheap (only needs NaCl) [11, 23, 38]. EW could be the solution for several challenges faced by food SMEs. However, an initial investment in the EW device is required.

Three main criteria were identified when selecting the suitable cleaning chemicals in these food SMEs: 1) cost, 2) type of cleaning chemicals, and 3) storage space. As discussed in Section D (under Result and Discussion), the cost of the cleaning chemical is a crucial criterion as food SMEs have limited allocation of the total sanitation cost. The cleaning chemical type is also a critical criterion. 46 % of the respondents used alkaline-based cleaning chemicals, 9 % used acidic-based cleaning chemicals, 18 % used formulated cleaning chemicals, and the other 27 % did not know the cleaning chemical used. This result demonstrates that using conventional cleaning chemicals is extensive in most SMEs.

However, as the green cleaner has been introduced, they are willing to replace the conventional cleaning chemical with a safer chemical formulation as both solutions serve the same purpose. They are also ready to propose green cleaners to the top management. This is because using green cleaner will help food SMEs overcome several cleaning challenges such as problems with cost, chemical storage area, minimizing the transportation cost, and only needing NaCl to generate the green cleaner. The wastewater treatment can also be minimized as EW would revert to its original form when interacting with organic matter [22, 23, 39]. They also stated

they are willing to spend on the initial investment (a cleaner green device). They were given two options which are 1) a central generator (only can produce EW), or 2) a portable electrolysis sanitation unit (water jet – electrolysis cell – hot water (a unit built with heating elements)). 46 % of the respondents chose the portable electrolysis sanitation unit and are willing to invest in the range of RM 10, 000 to RM 20, 000. This unit can solve several other problems, such as the hot water supply problem and the cleaning tools problem (water jet). Hot water can melt fat residue, and the water jet can clean difficult areas. Among the 11 respondents, 73 % used hot water for sanitation, and 82 % already had a water jet in their factories. Thus, 36 % and 18 % are willing to spend less than RM 10,000 and less than RM 5,000, respectively. They are willing to pay lower costs as they already have a water jet and hot water supply. Therefore, they prefer a central generator.

IV. Conclusion

Malaysian food SMEs have adequate knowledge of sanitation and sanitation programs. Moreover, most SMEs can design their sanitation program. However, for several reasons (e.g., economic constraints and high turnover rate), practicing a correct and efficient sanitation program is difficult for some companies. The high cost of cleaning chemicals and discharge of the used cleaning chemicals (after sanitation) to the drainage without treatment have become common problems among Malaysian food SMEs. Finding an alternative cleaning fluid has become more urgent as more people are concerned about the environment's health. Electrolyzed water, a novel green cleaner and disinfectant, was introduced to the respondents, and most of them are willing to invest in this green technology as it can solve most of the sanitation challenges/restrictions that food SMEs face. This survey showed that the portable electrolysis sanitation unit (which can generate electrolyzed water and hot water) could benefit SMEs regarding financial constraints, limited production areas, and more. Therefore, the plan to develop a portable electrolysis sanitation unit is proven to have market value for SME factory applications. Future work will focus on developing this sanitation unit.

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