

Existing Malaysian Palm Oil Mill Hygiene Evaluation Based on MeSTI Guidelines

Andrew Yap Kian Chung*; Rohaya Mohamed Halim* and Astimar Abdul Aziz*

*Malaysian Palm Oil Board (MPOB)

6, Persiaran Institusi, Bandar Baru Bangi, 43000 Kajang, Selangor, Malaysia.

E-mail: andrew@mpob.gov.my

ABSTRACT

Crude palm oil (CPO) is a commodity mainly used for edible purposes after further processed to refined, bleached and deodorised (RBD) palm oil. Thus, Malaysian palm oil mills are required to implement food safety assurance programs in order to fulfil food supply chain traceability. Ministry of Health (MOH) has introduced Food Safety is the Responsibility of the Industry (MeSTI) free certification scheme based on Food Hygiene Regulations 2009 requirements to assist Malaysian small and medium enterprises (SME) to fulfil the minimum regulation requirements. Since most of the Malaysian palm oil mills have been established way before MeSTI scheme introduction, existing palm oil mills establishments may not be able to comply with MeSTI certification requirements. In the effort to portray the gaps, a conventional palm oil mill has been identified to perform a pre-certification evaluation. Observation showed that the evaluated mill needs various enhancement in order to meet the general MeSTI requirements. The evaluation results could be useful to other mills as reference to strive for food safety assurance certification.

Keywords: Food safety assurance, MeSTI certification scheme and traceability.

INTRODUCTION

Edible refined, bleached and deodorised (RBD) palm oil is produced from crude palm oil (CPO) refining. Due to consumer health consciousness, Food Hygiene Regulations 2009 mandatorily demand all edible product producers to implement food safety assurance programs. In order to fulfil the supply chain traceability, Malaysian palm oil mills are inevitable to strive for such assurance

certification. Food Safety is the Responsibility of the Industry (MeSTI) introduced by the Ministry of Health (MOH) is a free certification scheme to assist Malaysian small and medium enterprises (SME) fulfil the minimum regulation requirements. Thus, as the expenditures requirement would be minimum, palm oil mills are urged to implement MeSTI in the initial stage even though the standard is lower than other international recognised food safety assurance systems.

In the effort to portray the gaps between existing palm oil mill establishment conditions with MeSTI requirements, a conventional palm oil mill has been identified to perform a pre-certification evaluation.

EVALUATION METHODOLOGY

The evaluation has been carried out by observation based on current practices and staff behaviour pertaining to food hygiene and food safety during a mill visit when fresh fruit bunches (FFB) were delivered and processed in steady state. Conclusions were made from available physical evident examinations including documentations and data made available during the visit. The evaluation objectives were:

- a) To evaluate the existing palm oil mill hygiene practice and condition establishment based on the Food Act 1983 requirement and Food Hygiene Regulations 2009.
- b) To provide improvement recommendations for hygiene conditions and practices that impact the CPO and palm kernel (PK) food safety produced in the existing palm oil mill.

- c) To establish standard operating procedures on food hygiene and safety for palm oil mill based on the guidelines set by the MOH for MeSTI certification.

The findings and recommendations will focus on:

1. Premise and facilities including plant layout and immediate surrounding condition, equipment and machineries including monitoring equipment, FFB handling, intermediate products and finished products storage, cleaning and sanitation facilities, and workers attire changing facilities.
2. Important processing steps and control parameters that posed high risk of food hazards contamination and need to be addressed as soon as possible.
3. Personnel hygiene and hygienic practice during production processes.
4. Documentation regarding food safety rules and hygiene policy, quality monitoring procedures, workers' training records *etc.*

EVALUATION FINDINGS

Several major non-conformances have been observed during the evaluation that needed immediate management attention in order to fulfil MeSTI certification requirements.

1. No food safety management system was implemented.

Food safety management system basically is a group of practices and procedures to be put in place to ensure regulatory compliance in risks and hazards control throughout the processing so that the food products are safe with prescribed quality. The palm oil did not implement any food safety management system at the time the of evaluation visit.

2. No clear policy and objectives on food safety and hygiene.

Food safety objectives are the goals established by respective food manufacturer to produce safe food products. The evaluation revealed that clear food safety and hygiene policy was not available thus, crucial food safety and hygiene elements, especially, contamination control have been inconsistently implemented.

3. Inadequate chemical contamination prevention actions.

Observation showed that chemical contaminations might occur at various processing points in the evaluated palm oil mill. FFB in the consignments from plantation or estate may be contaminated with pesticide residues. Heavy metals, rust, paint chips and non-food grade grease from cages, tipper and hopper, conveyor and storage tank were potential chemical contaminants for CPO as shown in *Figure 1*. Appropriate prevention actions and relevant precautions should be imposed to ensure chemical contamination is under control, as low as reasonably achievable.



Figure 1. Fresh fruit bunches (FFB) are loaded into rusty cages in open holding area.

4. Improper premise and process design to support hygienic processing.

Most of the Malaysian palm oil mills are using open concept design which is not fully protected and are partially exposed to surrounding environment as shown in *Figure 2*. Pests such as rats and birds may come into the premises and contaminate the respective facilities with droppings, hairs, feathers *etc.* Thus, such design fails to prevent food safety hazards and contamination can occur at any point along the food production chain, especially at kernel plant and digesters station where the surrounding was dirty and may promote pest infestation due to poor management as shown in *Figure 3*.



Figure 2. Roof and beams were rusty and dirty with cobwebs.



Figure 3. The premise compound was poorly maintained with oil clogging drain.

5. Inadequate process control, premise cleaning and sanitation control measures.

Food processing premises and facilities hygiene maintenance is a universal requirement to prevent contamination risk. Cleaning and sanitation program are food safety integral part that support contamination control. However, they are often neglected in mill operations as shown in *Figures 4* and *5*. Pest control program which could be contracted to esteemed service providers should be established and implemented to prevent pest entrance and infestations.



Figure 4. Dead rat and loose fruits were on the floor in processing area.



Figure 5. Premise and equipment were generally dirty without proper maintenance.

DISCUSSION

Under the provision of Food Hygiene Regulations 2009 sub-regulation 3, premise involves in preparing, preserving, packaging, storing, distributing, and selling food shall register with the MOH where such registration is valid for three years and must be renewed. Furthermore, food manufacturing premise is required to implement a food safety assurance program and establish a traceability system as stipulated in sub-regulation 9 and 10.

In general, all food manufacturing premises are required to be designed and constructed in such ways that facilitate cleaning and sanitation tasks. This includes physical separation of building and facilities from unfavourable or harmful environment that can contribute to contamination such as flood-prone area or waste disposal area, separate storage for raw materials and finished product, food and non-food, critical and non-critical process as well as production and non-production area.

Effective solid barrier construction structures such as walls and partition can be built to achieve physical separation that prevent dust, pests, dirt and other harmful elements from contaminating raw materials, equipment, conveyors and other food contact surface. Others such as netting on the roof or any opening can prevent entrance of birds, bats, rats and other small wild animals.

Food manufacturing premises building materials should be made of sturdy, non-contaminating and chemical resistant such as high-quality stainless steels and concrete. However, scheduled maintenance is crucial to keep the premises in good condition for extended time.

Food manufacturing personnel are responsible for food safety and hygiene control. Thus, adequate training is necessary to ensure efficient food safety and quality management and monitoring. Sub-regulation 30 and 31 stated that food handlers are required to attend recognised food handling training program and should be vaccinated with anti-typhoid vaccine. However, the Food Hygiene Regulations 2009 definition is unclear whether palm oil mill workers are considered as food handlers hence, further clarification and confirmation from relevant health department need to be referred.

Nevertheless, training is an important tool to enhance knowledge and increase awareness among the mill workers on issues regarding food safety, basic hygiene practice, pest control, cleaning and sanitation maintenance, *etc.*

Preventive maintenance is prerequisite in food safety management for effective and assured production. Well-maintained premise and equipment will extend the facility lifespan ensuring smooth and proper operation that enhances overall performance and produces good quality products.

Preventive maintenance inventory ensures the program covers all vital production areas. The inventories master list can be listed according to process or production area that should consist of information relevant to the equipment such as name or identifier (ID), respective description, location, manufacturer and warranty information, maintenance schedule, authorised vendor and person in charge.

General facility maintenance work can be carried out internally by qualified technicians and designated workers. However, specific maintenance jobs for complicated equipment are usually outsourced to respective manufacturers or authorised vendors. Each equipment maintenance schedule and procedures should be duly established according to the operation and maintenance manual (O&M) recommendations such as service procedures, lubrication specifications, tool reconciliation, emergency repairs, spare part inventory, operation training, task hand-over and maintenance work verification.

The maintenance frequency can be decided based on area risk assessment, equipment O&M manuals, and process vitality. Critical food safety production process usually demands for more frequent maintenance work.

Cleaning and sanitation contribute to major parts of maintenance that ensures the facility remains in working condition. Whilst washing the premises and equipment with water and chemicals detergent is impractical, mill management must endeavour to plan for daily clean up activity to keep the facility in acceptable hygiene level. Conveyors for fresh fruit bunch and crude oil must be free from contaminant that may deteriorate the quality and safety of CPO or PK.

FFB are the main raw materials for palm oil mill which are sourced from MSPO certified plantations or estates to ensure palm oil sustainability compliance with national and international requirements.

FFB should be handled with care to minimise bruises in order to produce quality crude palm oil containing less than 5% free fatty acids as specified in MPOB specifications.

All FFB consignments are weighed and graded by qualified graders according to *MPOB Fresh Fruit Bunches Grading Manual (Third Edition)*. Loading ramp and weighbridge areas should be free from muds, debris, stagnant water, grease and loose rotten fruits as required in Code of Practice (COP). Weighbridge and all measuring devices used in processing should be calibrated periodically to ensure accurate measurement. All calibration and inspection reports should be documented and kept according to ISO9001:2015 guidelines.

Further milling process should be proceeded according to the process flow with prescribed parameters. Sterilisation is critical due to the effect on the downstream processing efficiency. According to written standard operation procedures (SOP), the steriliser condensate oil should not be recovered into CPO. Sterilisers are pressured vessels that need to be inspected periodically by Machinery Department officers to ensure safe operation.

Thresher used for sterilised fruit bunches threshing should be free from lubricating oil. Oil leakage due to worn oil seals could be prevented by effective preventive maintenance program.

Digester should be loaded up to quarter full and temperature should be maintained between 90°C to 95°C during steady state operation. Digester should be completely emptied at the end of the processing.

Clean hot water instead of steriliser condensate should be used for CPO dilution in order to deduce oil viscosity. Sieving screen should be inspected to ensure good working condition and torn free prior to daily mill operation. Diluted crude palm oil (DCO) temperature should be maintained between 90°C-95°C. Precise clarifier desludging standard operation procedures should be made available and fully understood by respective station operators. Immediate

and appropriate remedy actions should be taken if spillage occurs during clarification. Crude oil tank should be regularly cleaned and inspected to avoid product contamination or leakage.

Both sludge tank and pure oil tank temperatures should remain between 90°C-95°C as clogging will occur at low temperature due to solidification while product's quality deteriorate at high temperature due to oil oxidation. Regular tanks cleaning and inspections are good practice recommendation.

CPO should be stored at temperature between 50°C-55°C for short term (less than a month) while heating element should be switched off for long term storage to let the storage tank to be at ambient temperature. Whenever tank heating is necessary, localised heating and tank pressure build up must be avoided.

CPO despatch is on first-in-first-out (FIFO) basis and representative samples should be taken for analysis prior to delivery. Dedicated CPO tankers, usually in orange colour, used to transport the consignment should be properly cleaned, dried and emptied during loading process. Finally, all tanker access points must be sealed with dedicated seal number. The consignment particulars such as oil quantity, seal number, transport vehicle registration number, departure date, *etc* should be duly recorded and documented. The loaded oil weight is determined by the difference in transport vehicle weight recorded by weighbridge before and after loading.

Leakage and spillage will cause profit loss to the mill thus, need to be minimised in the entire process. Leakage or spillage at any points should be effectively managed and the affected area needs to be appropriately cleaned. Food grade grease is highly recommended to prevent product contamination. All process and important parameters should be precisely documented and kept for future traceability and review purposes.

Press cake from mechanical screw presses consists of fibre and nuts which break up mechanically when passing through cake breaker conveyor (CBC). Kernel recovery starts with proper fibre-nut pneumatic separation. However, small nuts are often lost. The nuts are polished

to remove fibre that adhered on the shell in an air blowing rotating polishing drum. The blowing air cools the nuts while carry away the fibre so that nut shell become brittle and ease the nut cracking process.

The objective of nut cracking process control is to minimise uncracked nuts while avoiding excessive broken kernels. Crack mixture from nut cracker is fed into clay bath to separate palm kernel from nut shell fragments based on density difference. Thus, clay solution's specific gravity should be monitored at intervals in order to maintain it at 1.12 so that shells sink into bottom whereas kernels float on the surface. Certificate of analysis should be obtained from supplier to ensure the clay used in the process is heavy metals free. Palm kernels recovered from clay bath should be thoroughly rinsed with clean water. Thus, kernels are wet and need to be dried. The external surface moisture evaporates easily but internal moisture outward diffusion to surface is needed prior to evaporation. Palm kernels are dried and stored in silos fed with warm air. High temperature drastic drying should be avoided to prevent palm kernel oil from leaching out. General palm kernel specification allows 7% moisture content with 6% dirt.

Palm kernel silos should be clearly identified and maintained in good and clean condition, well-ventilated, covered and protected from foreign matters and pest infestation. An effective cleaning program should be established. Mould rotten palm kernels discovered during inspection need to be segregated and disposed according to documented protocols.

Traceability is knowing all sources within a supply chain all the way to the origin level. Sustainable palm oil traceability enables regulators and consumers to trace respective palm oil product until the origin, showing that the source is legal, ethically produced and comply with national and international requirements. Traceability in food safety involves documenting the production and distribution of food products at every process stage so that in case of food safety incidents, respective food products can be traced back to a common source or through all distribution channels. A proper and effective documentation system is needed to trace and track any identified problem or issues related to the product or process.

Feature Article

Comprehensive procedure and protocols include recording important data and parameter crucial to the safety and quality of product. It allows complete and up-to-date information of a product from source to destination.

CONCLUSION

Existing palm oil mill premise and facilities require improvement to produce quality crude palm oil and palm kernels that comply with MeSTI certification requirements. A food safety management system is essential to ensure

the food product is safe with prescribed quality through systematic and structured control procedures and protocols.

REFERENCES

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