

Material Safety Data Sheets for Palm Oil Products: Some Information and Suggestions

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ABSTRACT

Material safety data sheets (MSDS) are documents designed to provide both users and workers with the proper procedures for handling or working with those materials. Generally, it has been presumed that these documents are only relevant to substances that are considered rather dangerous. However, there were recently some requests for MSDS of palm oil and palm kernel oil, which are generally considered as 'harmless' food commodities under normal circumstances. This paper attempts to provide some basic information about MSDS, their history, their contents and some examples of existing MSDS and suggestions for data that could be used as references for inclusion in MSDS of palm oil products by their producers.

ABSTRAK

Risalah data keselamatan bahan (RDKB) adalah dokumen yang bertujuan untuk memaklumkan golongan pengguna dan pekerja berkenaan prosedur yang betul dan tepat apabila menggunakan atau mengendali sesuatu bahan. Lazimnya, RDKB dianggap adalah berkaitan dan hanya perlu bagi bahan-bahan yang merbahaya. Pada masa kini, ramai pengimport-pengimport meminta RDKB untuk minyak sawit, isirong sawit dan hasilan daripadanya, walaupun minyak tersebut dan hasilannya adalah komoditi makanan yang tidak merbahaya. Kertas kerja ini memberi sedikit maklumat asas berkaitan dengan RDKB dari segi sejarah, kandungan dan format. Diharap bahawa maklumat ini adalah manfaat dalam menyediakan RDKB minyak sawit dan hasilannya.

INTRODUCTION

In the mind of most people, MSDS are only relevant and necessary for those substances that are generally considered as rather dangerous or hazardous. However, with the increasing awareness on the safety about the consumption and handling of food ingredients, many importers of Malaysian palm oil products are asking for the MSDS from local producers. This appears rather unusual as palm oil and its products, like any other edible oils, are food ingredients and should not pose any hazard to human health. However, certain contingency measures are necessary should there be any serious accident occurring during the processing, handling or storage of edible oils and fats, and oleochemicals. Under such circumstances, the availability of MSDS would be of great help.

This paper attempts to provide basic information about MSDS for the benefit of the palm oil industry. The materials shown in this paper are strictly for reference only, as the manufacturers will have the final decision in the preparation of MSDS of their products and they are solely responsible for the contents given in these documents.

WHAT IS A MSDS?

MSDS are documents containing data relating to the technical safety, toxicological or ecological properties, and proper procedures for handling or working with chemical substances for the protection of human health and the environment. It usually includes amongst others, information such as basic physical properties (melting points, boiling points, flash points, etc.), toxicity, health effects, reactivity, storage, handling and disposal procedures, first aids, protective equipment requirements and spill/leak procedures. These are especially useful during an emergency or accident. The format of MSDS may vary, but they usually convey similar kind of information.

BACKGROUND OF MSDS

The concept of safe handling of chemicals is not new. It can be traced back to 4000 years ago in Egypt where the first written materials were found on the proper use and handling of some pharmaceuticals (Kaplan, 1991). Similar records, perhaps with more details, were made during the Greek and Roman Empire not only for medicinal preparations, but also extended to dye stuff and other chemicals. Such data sheets evolved through the periods of Dark Ages, Industrial Revolution and early 20th century as Chemical Data Sheets. In the last 150 years, data on the toxicity of chemicals and their health hazards were developed and were gradually included.

After World War II, the Department of Labour (DOL) of USA began to publish a series of documents called 'Controlling Chemical Hazards', and later The Chemical Manufacturers' Association published the 'Chemical Safety Data Sheets'. In 1968, the first original governmental document 'Material Safety Data Sheets (MSDS)' was introduced in USA by the Industrial Safety and Occupational Health Support Office. When the Occupational Safety and Health Administration (OSHA) was established within DOL in 1970, it took over the regulatory roles of MSDS. Under a new ruling in

1983, MSDS were made mandatory for all shipments of hazardous chemicals leaving the manufacturers' work place and from all importers of such on all shipments. Distributors and employers also had to comply with the same requirements.

FORMAT AND CONTENT OF MSDS

There are many formats for MSDS, but they all should provide the user with the required information. Such requirement might be regulated, as in the case of OSHA (1996), and in the European Community (Directive 91/155/EEC) or in the national regulations of the users' countries. In countries where there is no mandatory requirement, it is the responsibility of the producer to prepare the MSDS in a manner that will satisfy customer needs. *Table 1* compares the minimum information that should be included in the MSDS according to the requirements of OSHA and the European Union (EU).

Major differences exist between the OSHA and European Community requirements, particularly those pertaining to transportation. There are many different national regulations in Europe dealing with various products. MSDS are often used as the reference security information

TABLE 1. MINIMUM INFORMATION REQUIRED FOR MSDS

OSHA		EU	
	Chemical identity (as on label)	1	Identity of substance and manufacturer
I	Manufacturer's name and contact	2	Composition/information on ingredients
II	Hazardous ingredients	3	Hazard identification
III	Physical and chemical characteristics	4	First-aid measures
IV	Fire and explosive hazard data	5	Fire fighting measures
V	Reactivity data	6	Accidental release measures
VI	Health hazard data	7	Handling and storage
VII	Precautions for safe handling and use	8	Exposure controls/personal protection
VIII	Control measures	9	Physical and chemical properties
		10	Stability and reactivity
		11	Toxicological information
		12	Ecological information
		13	Disposal considerations
		14	Transport information
		15	Regulatory information
		16	Other information

for safety and environmental audits for hazardous materials. One example each is given in the *Appendices 1* and *2* for oleochemicals (extracted from MSDS) from reputable companies in Europe and USA.

Other formats used include those of The American National Standard Institute (ANSI) which is more stringent than that of OSHA, as it includes data on toxicology.

In the OSHA format, the CAS (chemical abstract service) number is not mandatory, though many companies include it voluntarily for easy identification. Inclusion of CAS number, where available should be encouraged especially in those cases where a chemical may be known in many different names (they should have the same CAS number).

The data in the MSDS should be reviewed and improvements should be made as and when needed. Thus, it is a good idea to have a reference number for each MSDS for easy traceability.

EXEMPTIONS FOR MSDS

Under OSHA, a completed product may be considered as an 'article'. An article means a manufactured item: (1) which is formed to a specific shape or design during manufacture, (2) which has end use functions dependent in whole or in part upon its shape or design during end use and (3) which does not release, or otherwise result in exposure to a hazardous chemical under normal conditions of use. Any product that meets this definition of an 'article' would be exempted from the requirement of the MSDS.

MSDS OF PALM OIL PRODUCTS

Oleochemicals

The Malaysian oleochemical manufacturers have already prepared MSDS for various products such as fatty acids, fatty alcohols and fatty esters. The Malaysian Oleochemical Group has also compiled a set of MSDS (MOMG, 1993) of basic palm-based oleochemicals, and also auxiliary materials used in the industry (such as catalyst, processing aids, *etc.*). As there are many types of products ranging from oleochemicals of high purity (>99%, such as lauric acid, cetyl alcohol, methyl stearate, *etc.*) to different mixtures (such as distilled palm fatty acids, palm kernel methyl esters, *etc.*), many MSDS have to be prepared as these products have very different properties and reactivity.

Palm and Palm Kernel Oils

In recent months, Malaysian refineries were faced with many requests from their customers for MSDS of palm oil products. These are necessary as many of them are introducing food safety, HACCP and/or risk assessment programmes in their manufacturing processes. In view of this development, some ideas on the format and data for MSDS of palm oil products might be useful to the manufacturers. We feel that there should be at least two MSDS, one each for palm and palm kernel oils. Their respective MSDS could cover their fractionated products. Those derived from other modification processes (*e.g.* hydrogenation and interesterification), and also the by-products such as fatty acid distillate and acid oils, perhaps should have separate MSDS as their properties might have large variations depending on the nature and conditions of processing.

As palm and palm kernel oils are food products, they are non-volatile, non-toxic and non-hazardous under normal circumstances. Thus data might not be necessary nor available for certain sections (*e.g.* exposure limits or toxicity). Some basic data on the chemical and physical properties should be included to enable the users to have a basic understanding of the products. As the spillage of any vegetable oil could pose certain hazards, such as in the event of a fire, sufficient details on the proper procedures to tackle these situations or accidents should be provided. For a start, perhaps the OSHA format, which is simpler, could be adopted unless otherwise demanded by the customers. An example for palm kernel oil is shown in *Appendix 3*.

MSDS FOR PALM OIL PROCESSORS

In the processing of palm oil products, including production of oleochemicals, many chemicals are also used. These may include phosphoric acid, bleaching clays, antioxidants, catalysts, emulsifiers, solvents, other processing aids and water treatment chemicals. Some of these are stored in sizeable quantities and might be hazardous under certain conditions. As a good manufacturing practice, it is recommended and prudent that MSDS for these materials be obtained from their manufacturers or suppliers, and made available to those who handle them. Staff members should be adequately trained to understand the importance and uses of MSDS as part of the safety management programme.

CONCLUSION

Though edible oils might appear to be innocuous under normal circumstances, they could be hazardous at high temperature, or in spillage during transportation and handling. It is thus quite reasonable that appropriate MSDS should be prepared and made available to those who might need them. It is also the responsibility of the producers to review the MSDS of their products from time to time in order to provide their clients with up-to-date information.

ACKNOWLEDGEMENT

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REFERENCES

KAPLAN, S A (1991). Development of material safety data sheets. Paper presented at the 191st ACS National Meeting, 13-18 April, New York.

MOMG (1993). *Material Safety Data Sheet (MSDS) Guide*. Issue 1. December 1993.

OSHA (1996). *OSHA Regulations (Standards – 29 CFR): Hazard Communication – 1910.1200*, 61 FR5507, USA Department of Labour.

Note

This paper is prepared with the good intention of sharing information and instil awareness on the subject of MSDS to the industry. The examples given in the appendices are meant for comparison of formats only. The information obtained is believed to be true at the time of writing. The content in the MSDS of a product is entirely the responsibility of its manufacturer.

MSDS BASED ON EU FORMAT

Conforms to 93/112/EC and ISO 11014-1

1. Product and company identification

Commercial description : Distilled palm fatty acid
Supplier

Emergency telephone :
number

2. Composition/information on ingredients

Substance/preparation : Substance
Chemical description : Saturated and unsaturated straight chain aliphatic monocarboxylic acids
CAS Number : 67701-08-0
EC Number : 2669327

3. Hazard identification

Human health hazards
Inhalation : Not applicable at ambient temperature. Vapour can cause irritation.
Skin contact : Unlikely to be irritant.
Eye contact : Can cause irritation.
Ingestion : Unlikely to be harmful unless excessive amount swallowed.
Physical/chemical hazards : None identified.
Environmental hazards : None identified.

4. First-aid measures

Inhalation : Remove to fresh air.
Skin contact : Wash off with plenty of water and soap.
Eye contact : Wash out with water. Get medical attention if any sensations persist.
Ingestion : Remove material from mouth. Drink plenty of water. If large amount swallowed or symptoms develop get medical attention.

5. Fire-fighting measures

Extinguishing media : Dry chemical, water spray, foam, carbon dioxide.
Unsuitable extinguishing media : None
Specific hazards : None
Protection of fire-fighters : Self-contained breathing apparatus, full protective clothing.

6. Accidental release measures

Personal precautions : Avoid contact with eyes. Do not breathe vapour.
Environmental precautions : Minimize contamination of drains, surface and ground water.
Methods for cleaning up : Transfer product to suitably labelled containers for disposal at an approved site. Absorb liquid spillage onto inert material (e.g. sand). Residues and small spillages may be washed away with water and detergent.

7. Handling and storage

Handling	:	No specific protective measures are required.
Other information	:	Smouldering can occur upon leakage onto fibrous insulation material. For quality reasons: Avoid elevated temperatures.

8. Exposure controls/personal protection

Engineering measures	:	Ensure ventilation or local exhaust if formation of vapour occurs.
Hygiene measures	:	Good industrial hygiene should be followed.
Occupational exposure limits	:	No occupational exposure limits have been established.
Personal protective equipment	:	Normal precautions should be observed as for handling all chemicals.

9. Physical and chemical properties

Physical state	:	Solid (20°C)
Colour	:	Pale yellow
Odour	:	Faint
pH	:	Not applicable
Boiling point/boiling range	:	>200°C
Solidification point	:	45°C
Flash point	:	180°C (Cleveland Open Cup)
Autoignition temperature	:	325°C
Explosion properties	:	Not to be expected
Oxidation properties	:	Not to be expected
Vapour pressure	:	<0.1 hPa (20°C)
Density	:	850 kg/m ³ (75°C)
Solubility in water	:	Insoluble
Solubility in other	:	Soluble in many organic solvents
Ingredients		
Partition coefficient (log Pow)	:	>3 (estimated)

10. Stability and reactivity

Stability	:	Stable under normal conditions.
Conditions to avoid	:	-
Materials to avoid	:	Oxidizing agents
Hazardous reactions	:	None
Hazardous decomposition products	:	None
Hazardous polymerization	:	Will not occur

11. Toxicological information

Acute toxicity		
Oral - LD ₅₀	:	>2 g/kg (rat)
Skin irritation	:	Not irritating (rabbit)
Eye irritation	:	Not irritating (rabbit)

Based on data for structurally similar substances.

12. Ecological information

Degradability	:	Readily biodegradable (according to the modified Sturm test)
Ecotoxicity		
LC ₅₀	:	>100 mg/l (fish - 48 hours)
EC ₅₀	:	>100 mg/l (<i>Pseudomonas putida</i> - 16 hours)

Based on data for structurally similar substances.

Appendix 1 (continued)

13. Disposal considerations

Methods of disposal : Re-use/recycling of waste highly recommended. Disposal according to the local legislation.
Contaminated packaging : Observe local regulations

14. Transport information

: Not classified in RID/ADR - ADNR - IMDG - ICAO/IATA-DGR

15. Regulatory information

EU Classification : This product is not dangerous according to the EU regulations
(67/548/EEC-88/379/EEC)

Inventory status

EU : EINECS
USA : TSCA-CSI
Canada : DSL
Japan : ENCS (2-608/2-609)
Australia : AICS
Korea : ECL (35126)
Philippines : PICCS
China : NEPA (reported)
Water pollution category : 1-slightly water endangering (KBwS)

16. Other information

Literature references : Acute toxicity and irritation studies on a series of fatty acids. J.Am. Oil Chem. Soc., 56 (1979), p. 760A

HISTORY

Date of printing
Date previous issue
Date of issue
Version

Prepared by

Disclaimer clause:

To the best of our knowledge, the information contained in this sheet is correct. However, we cannot accept responsibility or liability for any consequences arising from its use.

MSDS BASED ON OSHA FORMAT**STEARIC ACID****Material Safety Data Sheet**

Emergency Telephone Number

Effective Date:

PRODUCT IDENTIFICATION:

Synonyms: Octadecanoic acid; 1-heptadecanecarboxylic acid

Formula CAS No.: 57-11-4

Molecular Weight: 284.48

Hazardous Ingredients: Stearic acid

Chemical Formula: $\text{CH}_3(\text{CH}_2)_{16}\text{COOH}$ **PRECAUTIONARY MEASURES****CAUTION: MAY FORM COMBUSTIBLE DUST CONCENTRATIONS IN AIR.**

As part of good industrial and personal hygiene and safety procedure, avoid unnecessary exposure to the chemical substance and ensure prompt removal from skin, eyes and clothing.
Avoid dust cloud in presence of an ignition source. Store in a tightly closed container. Use with adequate ventilation.

EMERGENCY FIRST AID**SEE SECTION 5.****Physical Data****SECTION 1**

Appearance: White or yellowish-white powder

Odour: Odour resembles fats and oils.

Solubility: Very slightly soluble in water.

Boiling Point: 383°C (721°F).

Vapour Density (Air=1): No information found

Melting Point: 69-70°C (156-158°F)

Vapour Pressure (mm Hg): 1 @ 173.7°C

Density: 0.847 Evaporation Rate: No information found

NFPA Ratings: Health: 1 Flammability: 1 Reactivity: 0

Fire and Explosion**SECTION 2****Information**

Fire: As with most organic solids, fire is possible at elevated temperatures or by contact with an ignition source. Melted fatty acid can give 'grease' type fire.

Explosion: Fine dust dispersed in air in sufficient concentrations, and in the presence of an ignition source is a potential dust explosion hazard.

Fire Extinguishing Media: Dry chemical, foam or carbon dioxide. Pressure from the extinguishing media may cause severe dusting. Do not use heavy streams of water, molten material will float on water.

Appendix 2 (continued)

Special Information: In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operate in the pressure demand or other positive pressure mode.

Reactivity Data Section 3

Stability: Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products: Carbon dioxide and carbon monoxide may form when heated to decomposition.

Hazardous Polymerization: This substance does not polymerize.

Incompatibilities: Oxidizing agents.

Leak/Spill Disposal Information Section 4

Collect by scooping, mopping or wet vacuuming as appropriate. Collected waste may be transferred to a closed, preferably metal, container and sent to an approved waste disposal facility.

Ensure compliance with local, state and federal regulations.

Health compliance with local, state and federal regulations.

Health Hazard Information Section 5

A. Exposure/Health Effects

Inhalation: Nuisance dust. May cause coughing, sneezing or laboured breathing if large amounts are inhaled.

Ingestion: No adverse effects expected.

Skin Contact: Mild irritant, possibly causing surface inflammation, especially on prolonged contact with oily skin.

Eye Contact: May cause mechanical irritation.

Chronic Exposure: No adverse health effects expected.

Aggravation of Pre-existing Conditions: No information found.

B. FIRST AID

Inhalation: Remove to fresh air. Get medical attention for any breathing difficulty.

Ingestion: If large amounts were swallowed, give water to drink and get medical advice.

Skin Exposure: Not expected to require first aid measures.

Eye Exposure: Wash thoroughly with running water. Get medical advice if irritation develops.

C. TOXICITY (RTECS, 1986)

No LD50/LC50 information found relating to normal routes of occupational exposure. Irritation: skin rabbit 500 mg/24H moderate.

Occupational Control Measures Section 6

Airborne Exposure Limits: None established.

Ventilation System: In general, dilution ventilation is a satisfactory health hazard control

see page 26.

from page 23.

Appendix 2 (continued)

for this substance. However, if conditions of use create discomfort to the worker, a local exhaust system should be considered.

**Personal Respirators
(NIOSH Approved):**

For conditions of use where exposure to the dust is apparent, a dust/mist respirator may be worn. For emergencies, a self-contained breathing apparatus may be necessary.

Skin Protection:

Wear protective gloves and clean body-covering clothing.

Eye Protection:

Use chemical safety goggles. Contact lenses should not be worn when working with this material. Maintain eye wash fountain and quick-drench facilities in work area.

Storage and Special Information Section 7

Keep in a tightly container. Store in a cool, dry, ventilated area away from sources of heat or ignition. Protect against physical damage.

Company disclaimer clause:

DRAFT ONLY

Appendix 3

MATERIAL SAFETY DATA SHEET

REF. NO. (OR CODE NO.):

PRODUCT IDENTITY

PRODUCT : **RBD PALM KERNEL OIL**
Trade Name : Refined bleached and deodorized palm kernel oil
Chemical Family : Mixture of Triacyl glycerol or triglycerides
Manufacturer's code : (to be provided by the producer)

SECTION I – MANUFACTURER'S NAME AND CONTACT

Manufacturer :
Address :
Emergency Phone No. :
Emergency Fax No. :

SECTION II – HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

It is a edible product and is generally Recognized As Safe (GRAS) under Food, Drug and Cosmetic Act

Appearance : White solid below melting point. Light yellow liquid above melting point
Use : Edible purposes
Adverse health effect : Unknown

SECTION III – PHYSICAL DATA

Melting point : 25°C – 28°C
Boiling point : Decomposes, increasingly rapidly above 250°C
Vapour pressure : Negligible at 25°C
Moisture & Volatiles : Less than 0.2% at 100°C
Apparent density : 0.88 - 0.91 g/ml at 50°C
Flash point (open cup) : Greater than 270°C
Solubility : Insoluble in water. Soluble in hydrocarbons, chlorinated solvents, ester. Slightly soluble in alcohols, ketones, increasing with lower polarity. Miscible with lower fatty acids.

SECTION IV – FIRE AND EXPLOSION HAZARD DATA

Flammability : Non-flammable under normal condition. Only combustible in bulk if heated over 300°C. Fire risk low in bulk.
Fire/explosion hazard : Slight, when exposed to flame or very high temperatures.
Hazardous Combustion Products : Dense smoke, carbon monoxide, soot
Fire fighting : CO₂, dry powder, foam

SECTION V – REACTIVITY DATA

Stability	:	Biodegradable by most micro-organisms especially if adequate oxygen is available.
Hazardous Decomposition Products	:	None known

SECTION VI – HEALTH HAZARD DATA

Health Hazard (Acute and Chronic)	:	Non known
Carcinogen or Suspected Ingredients	:	None known
Effect of Exposure	:	None known
Emergency & First Aid	:	Eye - Flush thoroughly with water Skin - Wash with soap and water If necessary, seek medical treatment If splashed by hot oil, in which case treat for burns as appropriate. Only basic first aid facilities required

SECTION VII – PRECAUTIONS FOR SAFE HANDLING AND USE

Storage and transport	:	Not hazardous. Oil should be stored in clean, dry, non-tainting closed vessels, or in bulking tanks. It is an edible product and must not be contaminated,
Storage temperature	:	In bulk, store at temperature not more than 10°C above melting point. If heating is required to melt the oil, the rate should not exceed 5°C per 24 hr (for tank without stirrer).
Effect of light	:	Expose to ultraviolet light, especially sunlight, must be minimized to prevent quality loss.
Flooring	:	Seamless epoxy is most resistant to breakdown cause by prolonged contact with edible oil spills. Concrete are less resistant.
Spills	:	All spills will result in potentially hazardous slippery surfaces and should be dealt with promptly. Transfer spilled oil into nonporous containers of suitable strength. Clean up small spills with sand or other non-combustible absorbent material. Load sand/oil mixture into containers for disposal. Residual oil should be removed preferably with alkaline detergent. Do not use finely divided combustible materials (e.g. sawdust) to soak up oil, due to moderate risk of spontaneous combustion. Do not allow oil to contaminate wastewater drains, or streams and other natural watercourses.
Waste disposal	:	Dispose in approved landfill or burn by suitable non-polluting method. Rags soaked in oil should be burned. Note that spontaneous combustion may occur in piles of oil-soaked rags, cotton waste paper and the like.
Other information	:	Always work safely around open hatches on bulk tanks. The low density and relatively high viscosity of edible oils make flotation difficult for an immersed person. Edible oils pose little health or hazard problem. Good housekeeping in cleaning up spills promptly and preventing contamination of natural water or waste drains will avoid environmental problems.

SECTION VIII – PERSONAL PROTECTION FOR HANDLING

Exposure Limits	:	Not known
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Appendix 3 (continued)

- Personal protection** : Only required if exposed to at high temperature, as oil could cause burns to skin or eyes. In such cases wear appropriate protective apparel.
- Other precautions** ; Oil coatings on equipment, floors and clothing are slippery and may lead to physical injury due to falls. Foot-ware with anti-slip soles should be worn during handling.

SECTION IX – OTHER INFORMATION

Disclaimer

Information given in this draft material safety data sheet is given in good faith and for use as guideline only. The issuance and the content of the MSDS remain the responsibility of the manufacturer of the product.