RSPO Rules for Physical Transition of Oleochemicals and its Derivatives

1. General Terms

This procedure shall serve as a guiding structure to reflect on specifics of commonly used Oleochemicals and their derivatives produced from natural oils and fats with focus on palm and palm kernel oil. The industry has made great progress since the advent of the RSPO requirements for "RSPO approved Certificate System" merely a year ago and now the drive and intent to progress further to physical transition has resulted in the need for this paper which underlines the rules for physical transition of oleochemicals and their derivatives.

Often the diverse pool of well qualified participants seems to direct its efforts towards assuring that the system could not be tricked or corrupted. This often has resulted in very complex and sometimes incomprehensible roadmaps to compliance and confusion in the market place slowing the uptake of certified palm oil by buyers. We would want a system that provides for the physical transition of use of palm and palm kernel oil-based oleochemicals and its derivatives. We would also want that the system would be the lowest possible cost and have no impact on the way that business is currently conducted – in other words … *Keeping it simple is the key to the market uptake of sustainable certified palm oil. There is no chemical or physical test to differentiate certified from non-certified sustainable palm oil.*

This paper will cover amongst other things:

i) System to derive the amount of RSPO certified oils to be covered for the physical transition of oleochemicals and their derivatives along the supply chain (MB, SG or IP).
ii) Traceability system for Oleochemicals and their derivatives

This paper shall be reviewed on a biennial basis to reflect changing market conditions during the transition from conventional to RSPO certified palm products. Members and stakeholders are invited to share their experiences with this guideline to support the improvement process of this process through the RSPO Trade and Traceability Working Group Sub-Group.

This paper shall not claim to cover all options of derivatives for the oleochemical market. Therefore this shall leave room for a case by case dialogue between seller and buyer of products to reflect the specifics of technologies and supply chains, for presentation to RSPO and Chain of Custody auditor. Case by case dialogue and decisions shall be properly and transparently documented internally to allow for auditor scrutiny.

2. Scope

The scope has been limited to the major primary and secondary Oleochemicals and their derivatives to minimize complexity.

i) Fatty Acids
ii) Glycerine
iii) Soap
iv) Methyl Esters
v) Fatty Alcohols
vi) Fatty Amines
vii) Fatty Esters

3. Calculation Coverage

For clarification purposes this calculation scheme focuses on derivatives that contain a majority of C6-C18 C-Chains, products with other dominant C-Chains > C18 are out of scope as they will not be derived from palm and palm kernel oil.

3.1. Feedstock Identification

Due to the interchangeability of feedstocks to produce the same derivative, the choice of feedstock shall be determined by the manufacturer based on the actual process route used for SG products or the intended MB products.

3.2. General Guideline for Calculation:

Four factors may be used in the calculation scheme:

1. **Oil Yield Factor** to follow RSPO T&T SC existing rule: 0.45 (PKO); 0.292 (PK OL); 0.188 (RBDS); 0.752 (RBDPOL); 0.05% (PFAD).
2. **Splitting Factor** based on FA:Glycerin 0.9:0.1
3. **Product Conversion Factor** - This factor determines the proportion of palm vs. non-palm portion of the product based on molecular weight. Unlike other factors, this factor will also apply to downgrading from SG oils → MB products. The conversion factors act as guidelines in the case of SG products where the actual physical yield will be used.
4. **Fatty Acid Composition Factor** is based on the proportion of the fatty acid chain length in the product vs. raw material. This is based on carbon chainlength distribution provided by the Malaysian Palm Oil Board refer section 3.3a Fatty acid fraction guideline and 3.3b MPOB carbon chainlength guideline.

Calculation Methodology for MB products:

1. For basic Oleochemicals the 1:1 rule shall apply as their molecular weight does not differ significantly from the precursor vegetable oils.
2. For all other derivatives, oil coverage requirement would be in accordance with the basic oleochemical content of the material using chemical stoichiometric principles based on the the Product Conversion Factor.
3. In the case of products made from mixed palm and palm kernel oil, the oil coverage may be based on the major oil component of the product.
4. In addition, glycerine will also be covered under the 1:1 rule as this represents the major yield loss in producing oleochemicals from their precursor oils.
5. Ascertain the proportion of palm portion in your final product i.e. 1 if entirely from palm or lower fractions based on ratio of molecular weight of palm to the overall molecular weight of the product – this will be the Product Conversion Factor. Use standard factors provided in table 3.4 where applicable.

Calculation Methodology for SG products:

1. SG products are obtained through proper segregation requirements in the manufacturing and handling processes. Therefore, the oil requirement from this calculation scheme is used as a guideline only and actual yields are to be based on operation.
2. Ascertain the proportion of palm portion in your final product i.e. 1 if entirely from palm or lower fractions based on ratio of molecular weight of palm to the overall molecular weight of the product – this will be the Product Conversion Factor. Use standard factors provided in table 3.4 where applicable.
3. In the case of products made from mixed palm and palm kernel oil, the oil coverage may be based on the major oil component of the product.
4. Determine the proportion of palm or palm kernel oil required based on the fatty acid composition of the product – this will be the Fatty Acid Composition Factor referring to tables 3.3a and 3.3b based on SG requirements.
5. Apply the Splitting Factors for fatty acid and glycerine of 0.9:0.1 respectively. This factor will only apply to SG and not MB products.
6. Apply the Oil Yield Factors are based on proposals from RSPO T&T SC
7. To produce 1MT of product requires 1X Product Conversion Factor/ (Fatty Acid Composition Factor X Splitting Factors X Oil Yield Factors

3.3a. Fatty acids fraction guideline

Product	Description	FA Factor, f
Fatty acid to glycerin yield	The fatty acid to glycerin ratio upon hydrolysis is taken as 9:1.	-
PKFA/ PKOLFA, PFAD/ PKFAD and Residue-based material	Fatty acids derived from PK olein will be considered equivalent to PKO. Yield for PFAD and PKFAD is taken as 5% respectively. Residue-based oleochemicals are considered to have a yield factor of 1.	-
For SG products: Pure fractions: C6, C8, C10, C12, C14, C16 and C18 Mix cut: C8 – 10, C12 – 14, C16 – 18, TCPKFA, SiPOFA	All chain lengths (C6 – 18s) will be included for factor derivation.	f = % concentration in source oil (refer MPOB guide) for SG products
Split/Distilled Fatty Acids: PKFA/ DPKFA, RBDSFA/ DRBDSFA, POFA/ DPOFA	All split/distilled fatty acids are considered to be equivalent to their source oil.	1:1 if derived from PKO/ PK OL or RBDPS or POL respectively
For Oleic acid	All chain lengths from saturated and unsaturated C18 will be taken into consideration for factor derivation.	f = y/(Total C18s of Oleic acid) Where y = 20 (PKO/PKOL), 55 (RBDPO), 36 (RBDPS)
Product derivation from Palm or PK is flexible but the appropriate factors must be used for mass balance.		

3.3b. MPOB Carbon chainlength guideline

Chainlengths	Palm Kernel Oil	Palm Oil	Palm Stearine	Palm Olein
C6	0.5	-	-	-
C8	4.5	-	-	-
C10	3.5	-	-	-
C12	48.5	0.1	0.3	0.3
C14	15.5	1.0	1.5	1.0
C16	8	44.0	62.4	40.2
C18	2	4.4	5.0	4.4
C18:1	15	40.1	24.9	42.8
C18:2	2.5	10.4	5.9	11.3

3.4. Conversion Factors

This table shall serve as a guiding structure for the commonly used Oleochemicals and derivatives

Index	Material	Conversion Factor
1	Fatty Acids	1.0
2	Fatty Alcohols	1.0
3	Methyl Esters	1.0
4	Fatty Amines	1.0
5	Glycerine	1.0
6	Cocamidopropyl Betaine	0.6
7	Sodium Lauryl Sulfate	0.7
8	Sodium Laureth-1 Sulfate	0.6
9	Sodium Laureth-2 Sulfate	0.5
10	Sodium Laureth-3 Sulfate	0.5
11	Sodium Stearate	0.9
12	Sodium Palm Kernelate	0.9
13	Laureth-7	0.4
14	Steareth-7	0.8
15	Cocamide MEA	0.8
16	Cocamide DEA	0.6
17	Stearamidopropyldimethylamine	0.7
18	Cetyltrimethylammonium chloride	0.8
19	Isopropyl Esters (e.g. IPM, IPP)	0.8
21	Caprylic/Capric Triglyceride (e.g. MCT)	1.0
22	Fatty Isethionate (e.g. Sodium Cocyl Isethionate)	0.6
23	Alkylpolyglycoside	0.4
24	Glycerol Esters (Mono-, Di- and Triglycerides)	1.0
25	Polyglycerol Esters	1.0
26	Sorbitan Monoglyceride	0.7
27	Sorbitan Triglyceride	0.9
28	Polysorbate 60 (Ethoxylated SMS), Polysorbate 80 (Ethoxylated SMO)	0.2
29	Polysorbate 65 (Ethoxylated STS)	0.5
30	Propylene Glycol Monoester	0.9
31	Lactylated Monoglycerides	0.8
32	Metallic Salts of Lactylic Esters of Fatty Acids (Sodium Stearoyl Lactylate, Calcium Stearoyl Lactylate)	0.6

Index	Material	Conversion Factor
33	Acetylated Monoglycerides	0.9
34	Succinylated Monoglycerides	0.8
35	Ethoxylated Monoglycerides (Polyglycerate 60)	0.8
36	Sucrose esters of fatty acids	0.5
37	Diacetyltartaric acid esters of monoglycerides (DATEM)	0.6
38	Monoglyceride citrate	0.7
39	Stearoyl Lactylic Acid	0.7
40	Stearyl Tartarate	0.4
41	Sodium stearoyl Fumarate	0.7
42	Carboxylic acid Soap	0.9
43	N-Butyl Esters	0.8
44	2-Ethyl Hexyl Esters	0.7
45	TMP Esters (TMP C8-C10 triester)	0.5
46	Ethylene Glycol Monoesters (EGMS)	0.9
47	Ethylene Glycol Diesters (EGDS)	0.9

**Based on material at 100% active (excluding water/ solvent)*
Items 1 – 23 are adopted from the approved RSPO Rules for Home and Personal Care Derivatives

Examples of calculation for SG and MB oleochemicals:
C6 – C14-based fatty acids:

Model	Product required	CSPKO (SG)	CSPKO (MB)
SG	C6 (SG)	222MT [(1/0.9)/0.005f]	-
	C8 (SG)	25MT [(1/0.9)/0.045f]	-
	C10 (SG)	32MT [(1/0.9)/0.035f]	-
	C12 (SG)	2.3MT [(1/0.9)/0.485f]	-
	C14 (SG)	7.2MT [(1/0.9)/0.155f]	-
	C8 – 10 (SG)	14MT [(1/0.9)/0.08f]	-
	C12 – 14 (SG)	1.8MT [(1/0.9)/0.64f]	-
MB	C6 (MB)	1MT	1MT
	C8 (MB)	1MT	1MT
	C10 (MB)	1MT	1MT
	C12 (MB)	1MT	1MT
	C14 (MB)	1MT	1MT
	C8 – 10 (MB)	1MT	1MT
	C12 – 14 (MB)	1MT	1MT
	C6 – 14 (MB)	1MT	1MT

C16 – 18-based fatty acids:

Model	Product Required	CSPO (SG)	CSPKO (SG)	CSPO (MB)	CSPKO (MB)
SG	C16 (SG)	2.5MT [(1/0.9)/0.44f]	14MT [(1/0.9)/0.08f]	-	-
	C18 (SG)	2.0MT [(1/0.9)/0.55f]	5.5MT [(1/0.9)/0.20f]	-	-
	C16 – 18 (SG)	1.1MT [(1/0.9)/0.99f]	4MT [(1/0.9)/0.28f]	-	-
MB	C16 (MB)	1MT	1MT	1MT	1MT
	C18 (MB)	1MT	1MT	1MT	1MT
	C16 – 18(MB)	1MT	1MT	1MT	1MT

Oleic acid and Glycerin

Model	Oil required PMT product	CSPO (SG)	CSPKO (SG)	CSPO (MB)	CSPKO (MB)
SG	Palm Oleic acid (SG)	2.0MT [(1/0.9)/0.55f]	-	-	-
	PK Oleic acid (SG)	-	5.5MT [(1/0.9)/0.20f]	-	-
	Glycerin (SG)	10MT [(1/0.1]	10MT [(1/0.1]	-	-
MB	Palm Oleic acid (MB)	1MT	1MT	1MT	-
	PK Oleic acid (MB)	1MT	1MT	-	1MT
	Glycerin (MB)	1MT	1MT	1MT	1MT

Other examples of oleochemical derivatives:

Model	Oil required PMT product	CSPO (SG)	CSPKO (SG)	CSPO (MB)
SG	Isopropyl Myristate 90% min	-	5.7MT [(1/0.9)/0.155X 0.8]	-
	Isopropyl Palmitate 90% min	2.0MT [(1/0.9)/0.44 X 0.8]	11.1MT [(1/0.9)/0.08 X 0.8]	-
MB	Isopropyl Myristate 90% min	-	0.8MT (1X 0.8)	-
	Isopropyl Palmitate 90% min	0.8MT (1 X 0.8)	0.8MT (1 X0.8)	0.8MT (1 X 0.8)
SG	2EHS (where C18 >90%)	1.4MT [(1/0.9)/0.55X0.7]	3.9MT [(1/0.9)/0.20X0.7]	-
	2EHS (where C16 + C18 >90%)	0.8MT [(1/0.9)/0.99X0.7]	2.8MT [(1/0.9)/0.28X0.7]	-
MB	2EHS (where C18 >90%)	0.7MT (1 X 0.7)	0.7MT (1 X 0.7)	0.7MT (1 X 0.7)
	2EHS (where C16 + C18 >90%)	0.7MT (1 X 0.7)	0.7MT (1 X 0.7)	0.7MT (1 X 0.7)

Model	Oil required PMT product	CSPO (SG)	CSPKO (SG)	CSPO (MB)	CSPKO (MB)
SG	80/20 Palm/Palm Kernel-based Soap Noodles	0.8MT [(1/0.9)/1.0X0.9] X 0.8	0.2MT [(1/0.9)/1.0X0.9] X 0.2	-	-
MB	80/20 Palm/Palm Kernel-based Soap Noodles	0.7MT (1X0.9)X0.8	0.2MT (1X0.9)X0.2	0.7MT (1X0.9)X0.8	0.2MT (1X0.9)X0.2
		Or 0.9MT (1X0.9) CSPO		Or 0.9MT (1X0.9) CSPO	

4. Traceability System

Tracking system for palm kernel-derived oils and palm-derived oils will be based on RSPO traceability whereas oleochemicals will be based on RSPO SCCS only.