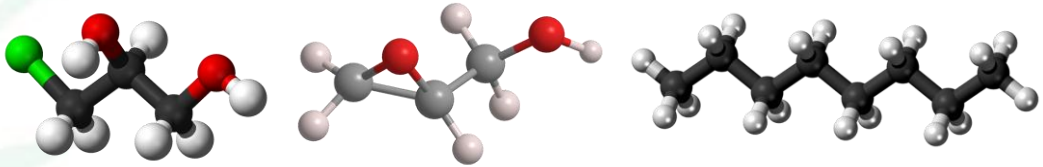
Pematuhan Keselamatan Makanan Berkaitan 3-MCPDE, GE dan Minyak Mineral Hidrokarbon

KEMENTERIAN PERLADANGAN DAN KOMODITI

MPOB

KEMENTERIAN KESIHATAN MALAYSIA

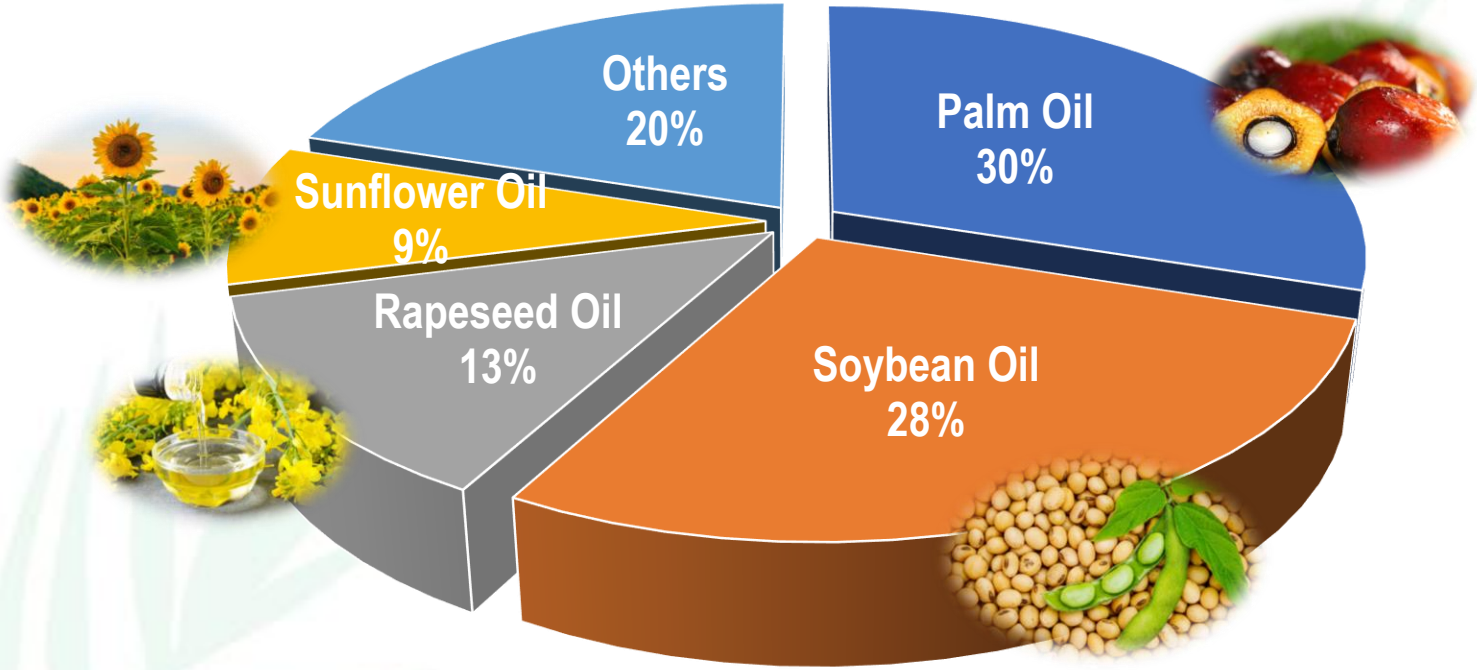
Unit Analitikal & Pembangunan Kualiti
Bahagian Penyelidikan Pembangunan Produk & Khidmat Nasihat
Lembaga Minyak Sawit Malaysia (MPOB)



Latar Belakang

- Malaysia merupakan pengeluar minyak sawit kedua terbesar di dunia dengan kebanyakan produk sawit di eksport
- Kegunaan utama minyak sawit adalah sebagai makanan – minyak masak & bahan dalam makanan
- Keselamatan makanan global mesti dipatuhi
- Tekanan daripada pasaran eksport (EU, antarabangsa)

Pasaran Minyak Utama (2025)



Kegunaan Minyak Sawit

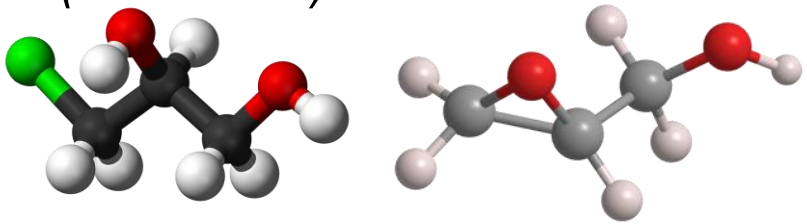
75% minyak sawit Malaysia di eksport

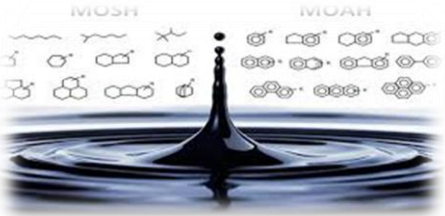
75% minyak sawit digunakan untuk makanan

- Cooking oil
- Specialty fat products
- Solid- and semi-solid fat industry
- Non-dairy based industry
- Snack foods
- Supplements
- Bakery products

Bahan Cemar Dalam Minyak Sawit

- *3-monochloropropane 1, 2-diol esters (3-MCPDE)*
- *Glycidyl esters (GE)*
- Minyak mineral hidrokarbon
- Bahan cemar proses dan bahan cemar luaran – *environmental*

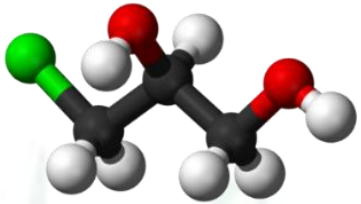




Risiko Keselamatan

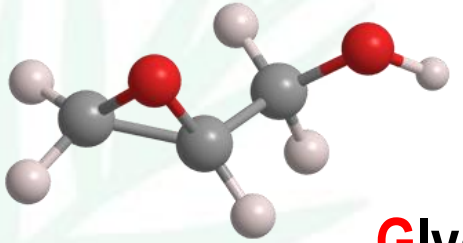
3-MCPD — **Possibly** carcinogenic to humans

3-monochloropropanediol — Nephrotoxic (EFSA Report 2016)



3-MCPDE — Nephrotoxic (EFSA Report 2016)

3-monochloropropanediol ester



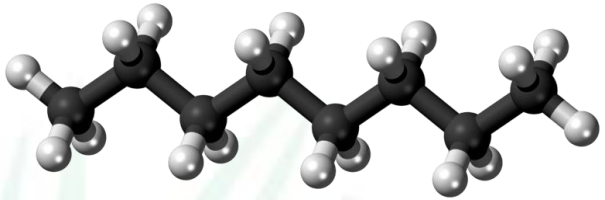
GE — **Probably** carcinogenic to humans

Glycidyl ester

Risiko Keselamatan

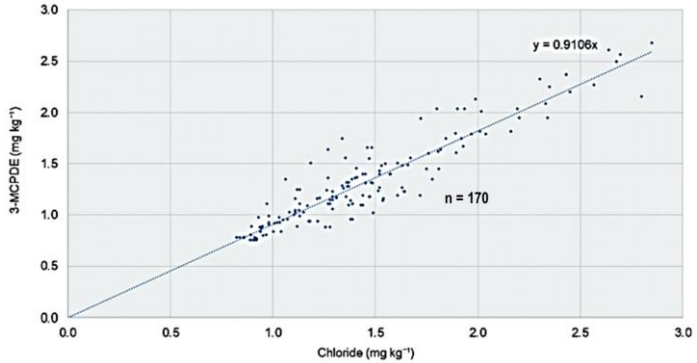
MOAH

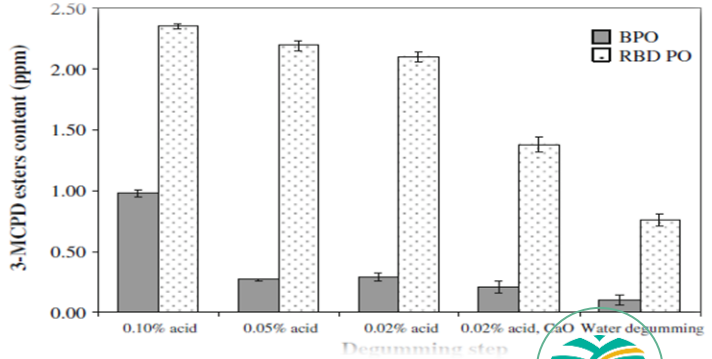
Mineral **O**il **A**romatic **H**ydrocarbon **Potential** carcinogenic to humans



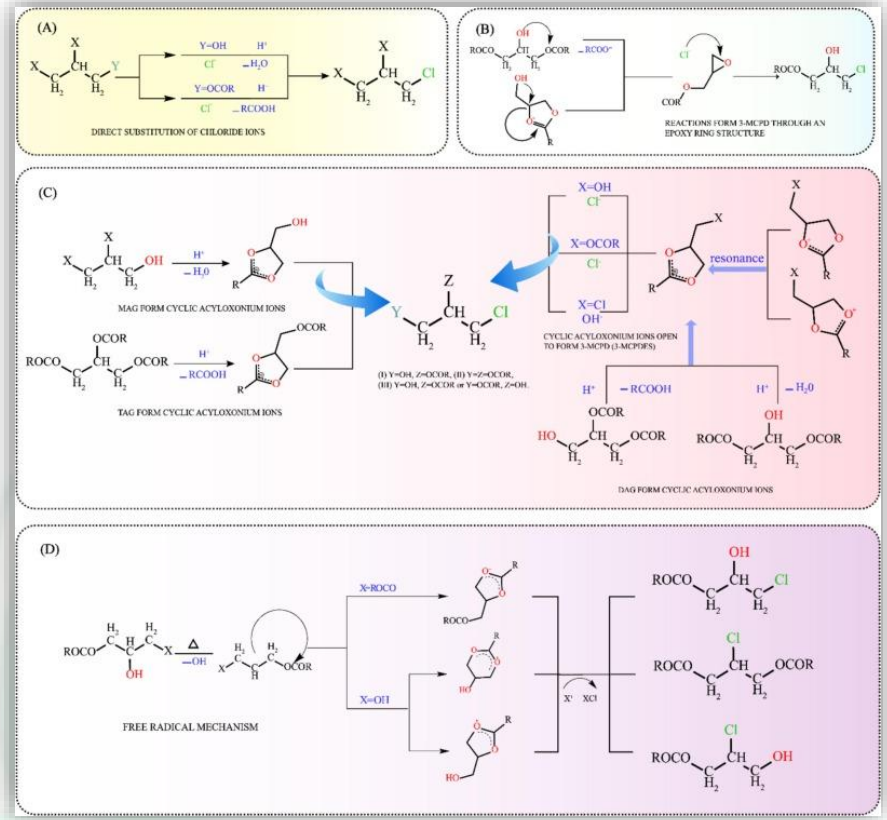
Faktor-Faktor Yang Mempengaruhi Pembentukan 3-MCPDE dan GE

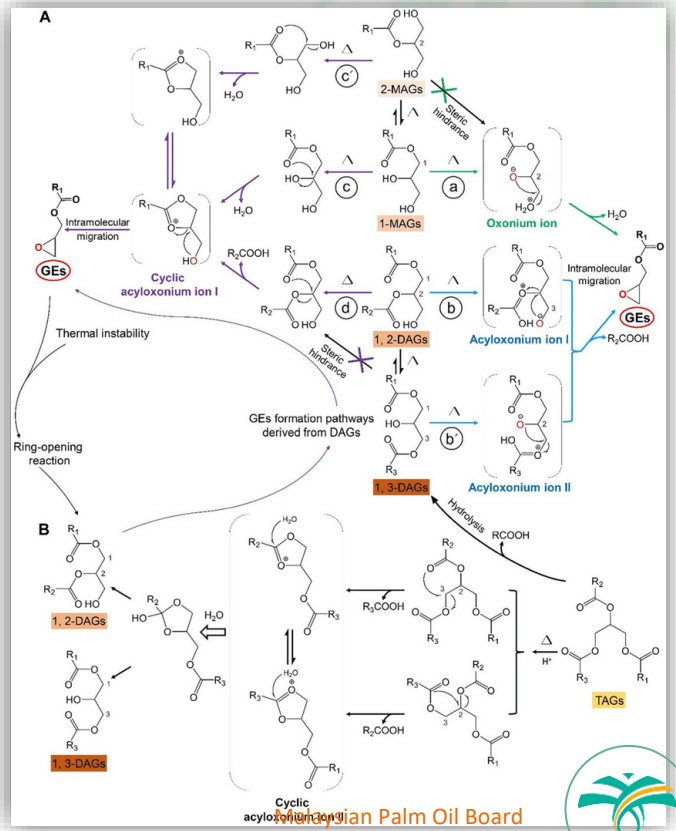
- **Precursors**
  - Klorida
  - *Diacylglycerol*
- **Suhu pemprosesan yang tinggi**
  - Nyahbau (*deodorisation*)
- **Keadaan penapisan yang berasid**
  - Nyahgam (*degumming*)
  - Tanah peluntur teraktif asid (*acid activated clay*)



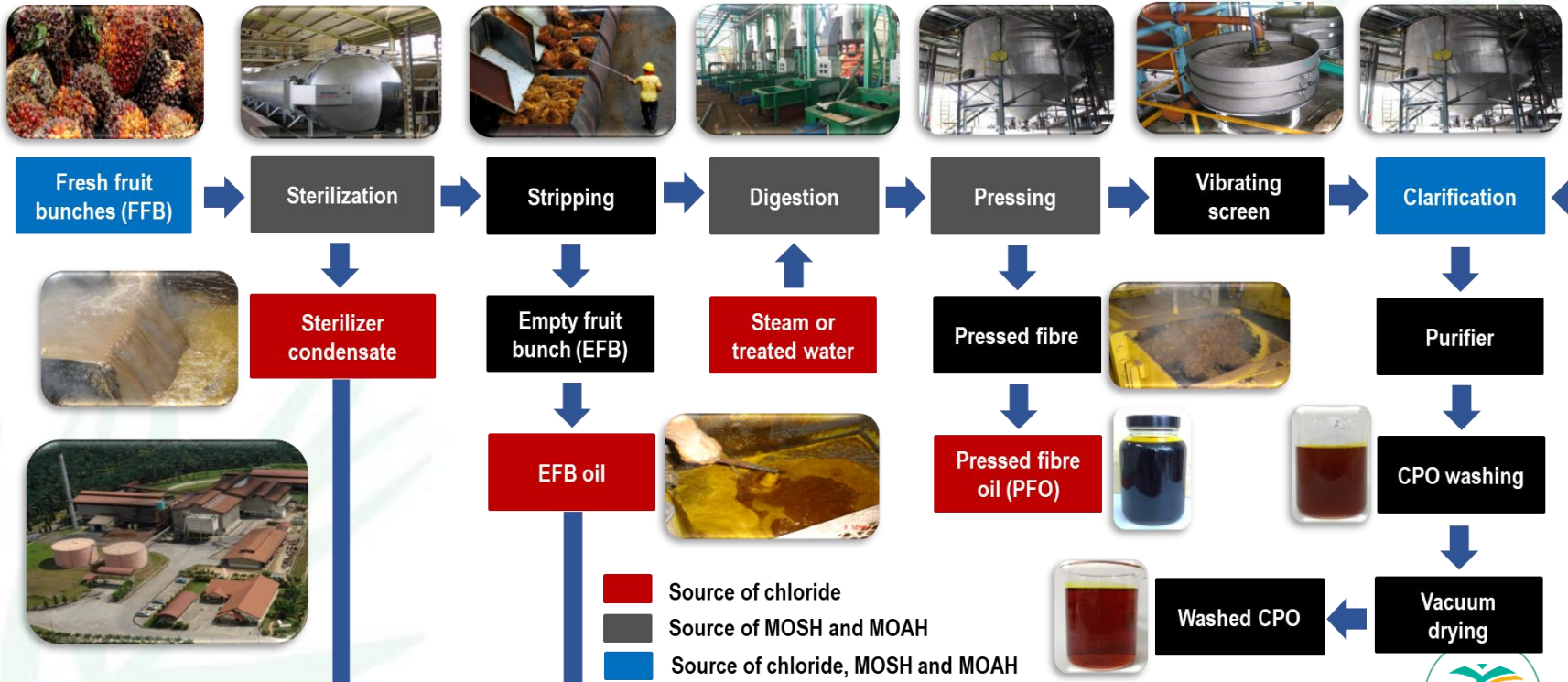


Mekanisma Pembentukan 3-MCPDE dan GE





Sumber Pencemaran Di Kilang Buah Sawit



Sumber Pencemaran Di Kilang Penapisan

Source of chloride Formation of 3-MCPDE and GE

REFINING

Low chloride content

Washed CPO → Degumming → Bleaching → Deodorization → RBD Palm Oil

T ~ 260 to 270°C

FRACTIONATION

Post-refined RBD Palm Oil → RBD Palm Olein / RBD Palm Stearin

Higher 3-MCPDE / GE in liquid fraction

Lower 3-MCPDE / GE in solid fraction

Material	Chloride content (ppm)
Phosphoric acid	1 to 2
Citric acid	1
Bleaching earth	60 to 152

Standard dan Had Antarabangsa

5.5.2023 EN Official Journal of the European Union L 119/103

GE

COMMISSION REGULATION (EU) 2023/915

of 25 April 2023

on maximum levels for certain contaminants in food and repealing Regulation (EC) No 1881/2006

Enter into force on 5 May 2023

Item 4.2	Foodstuffs	Maximum level of GE
4.2.1	Vegetable oils and fats (including palm oil) placed on the market for the final consumer or for use as an ingredient in food with the exception of the foods referred to item 4.2.2	1 ppm
4.2.2	Vegetable oils and fats destined for the production of baby food and processed cereal based food for infants and young children	0.5 ppm
4.2.3	Infant formula, follow-on formula and foods for special medical purposes intended for infants and young children (powder)	0.050 ppm
4.2.4	Infant formula, follow-on formula and foods for special medical purposes intended for infants and young children (liquid)	0.006 ppm

3-MCPDE

COMMISSION REGULATION (EU) 2023/915

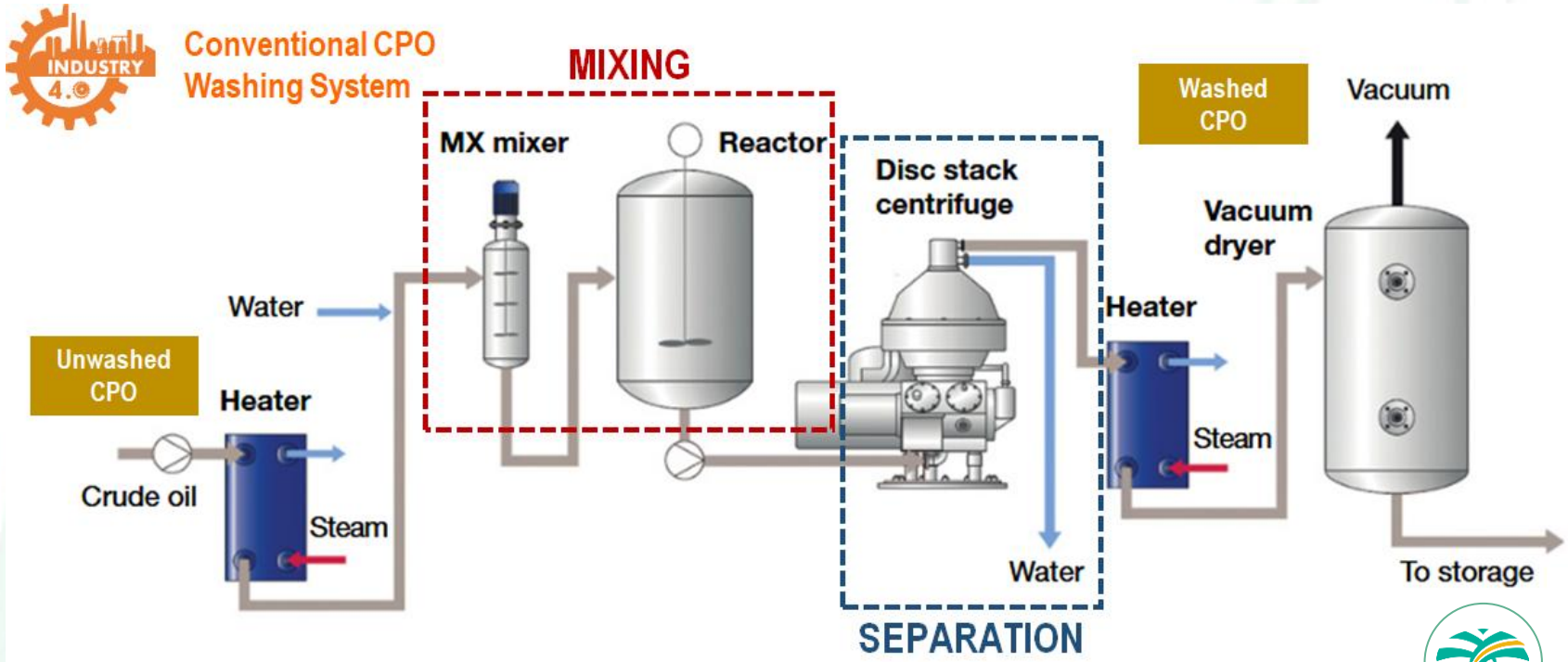
of 25 April 2023

on maximum levels for certain contaminants in food and repealing Regulation (EC) No 1881/2006

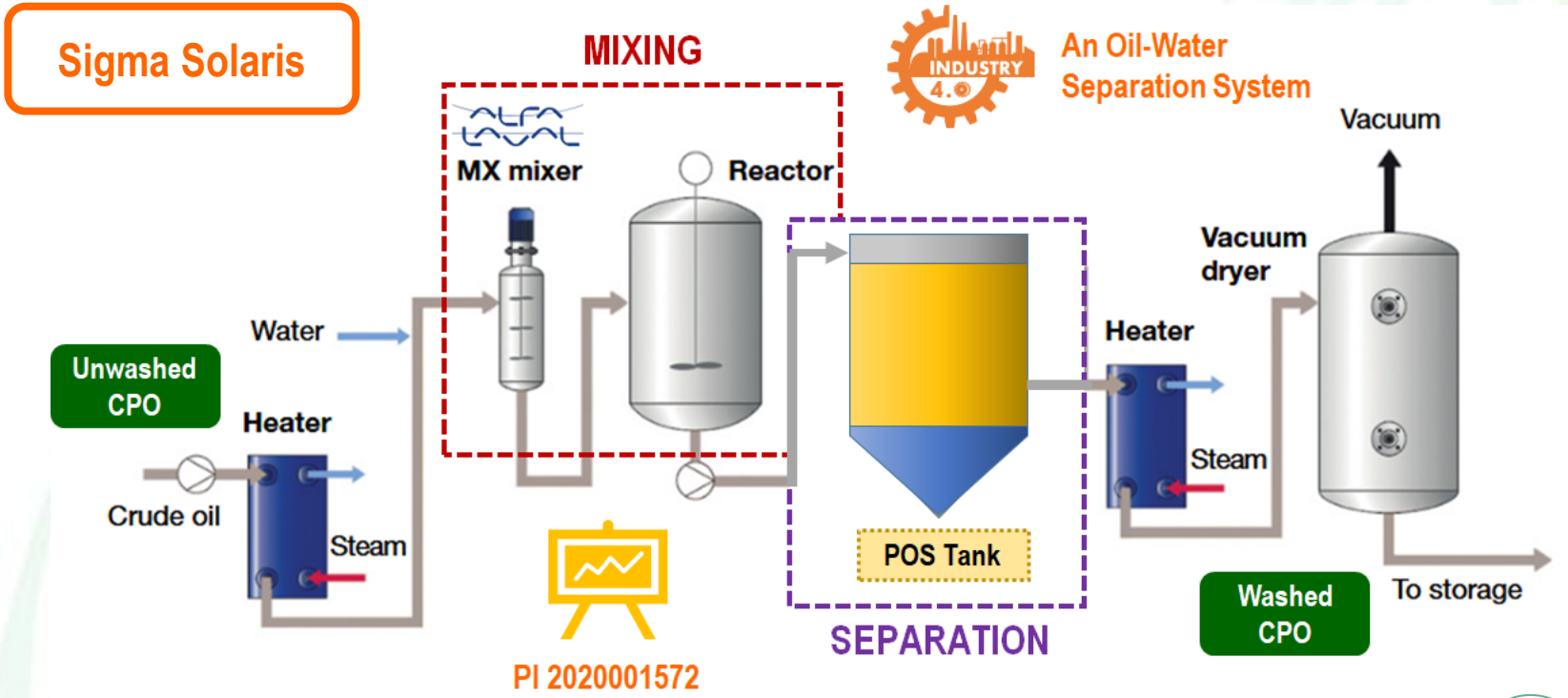
Enter into force on 5 May 2023

Item 4.3	Foodstuffs	Maximum level of 3-MCPDE
4.3.1	Vegetable oils and fats, fish oils and oils from other marine organisms placed on the market for the final consumer or for use as an ingredient in food falling within the following categories, with the exception of the foods referred to in [2] and of virgin olive oils and fats from coconut, maize, rapeseed, sunflower, soybean, palm kernel and olive oils (composed of refined olive oil and virgin olive oil) (and mixtures of oils and fats with oils and fats only from this category)	1.25 ppm
	Other vegetable oils (including palm oil, pomace olive oils), fish oils and oils from other marine organisms and mixtures of oils and fats with oils and fats only from this category	2.5 ppm
	Mixtures of oils and fats from the two above mentioned categories	2.5 ppm
4.3.2	Vegetable oils and fats, fish oils and oils from other marine organisms destined for the production of baby food and processed cereal based food for infants and young children	0.75 ppm
4.3.3	Infant formula, follow-on formula and foods for special medical purposes intended for infants and young children (powder)	0.125 ppm
4.3.4	Infant formula, follow-on formula and foods for special medical purposes intended for infants and young children (liquid)	0.015 ppm

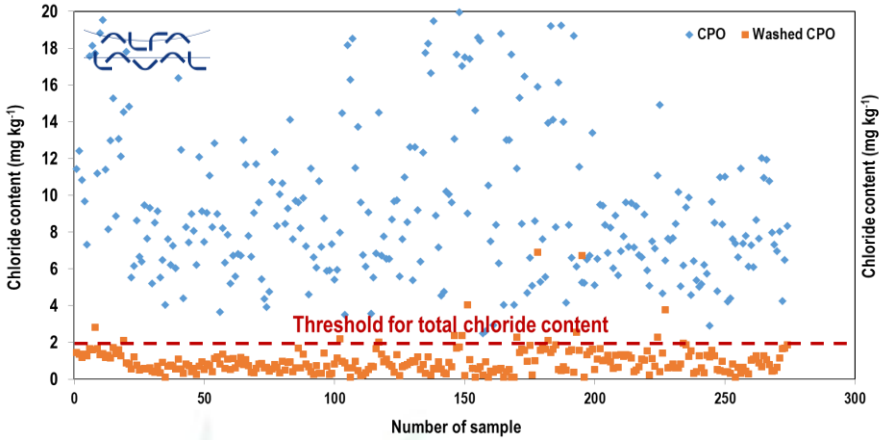
Sistem Pembasuhan Minyak Sawit Mentah (MSM)

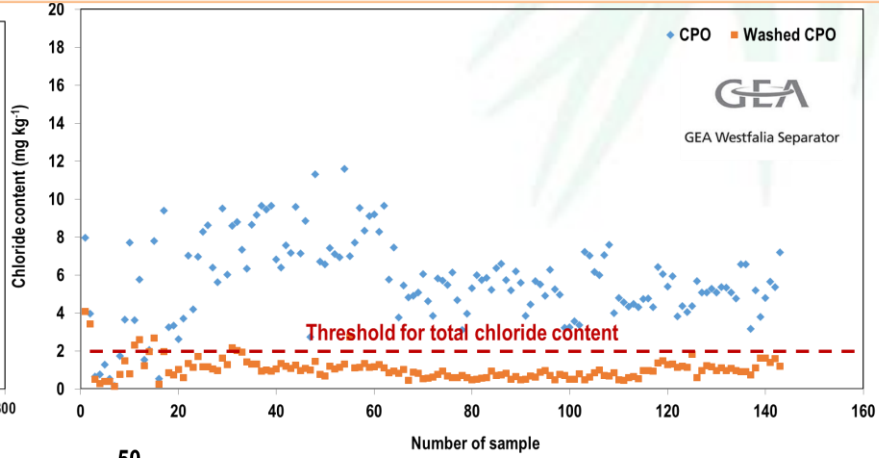


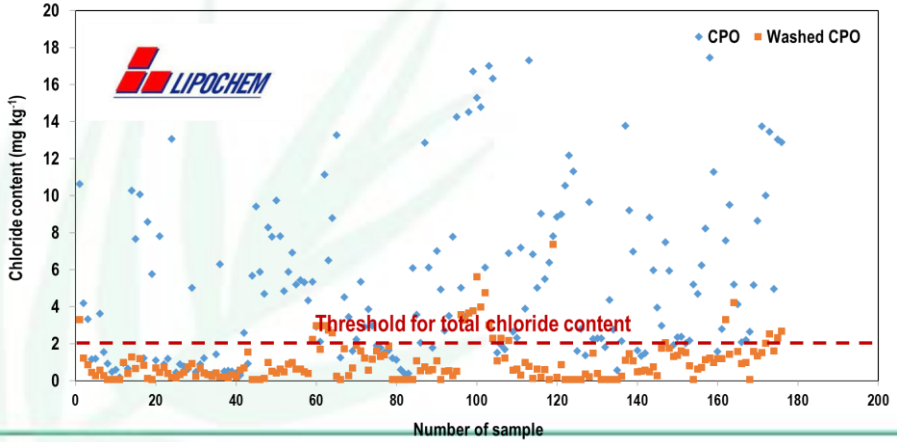
Sistem Pembasuhan MSM

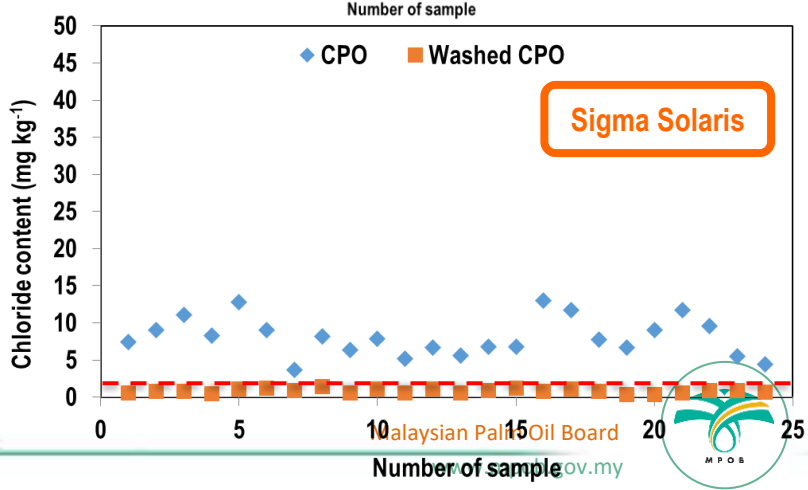


Kesan Pembasuhan MSM









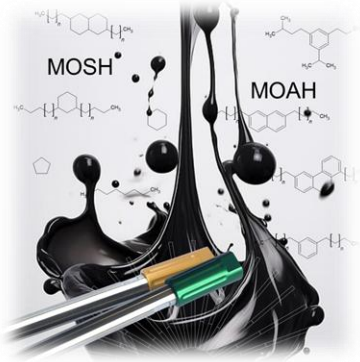
Penapisan MSM Yang Di Basuh

Quality Parameters	Unwashed CPO	Washed CPO
FFA (%)	4.2 ± 0.3	4.1 ± 0.3
Impurities (%)	0.045 ± 0.004	0.010 ± 0.004
DOBI	2.3 ± 0.1	2.4 ± 0.1
PV (meq O_2 kg^{-1})	2.1 ± 0.7	2.1 ± 0.7
p-anisidine value (unit)	3.4 ± 0.7	2.0 ± 0.7
Iron (mg kg^{-1})	5.1 ± 0.7	4.2 ± 0.5
Phosphorus (mg kg^{-1})	15.6 ± 0.9	11.9 ± 0.7
Chloride content (mg kg^{-1})	7.6 ± 0.9	2.0 ± 0.2
3-MCPDE in PPO (mg kg^{-1})	4.5 ± 1.3	1.2 ± 0.1

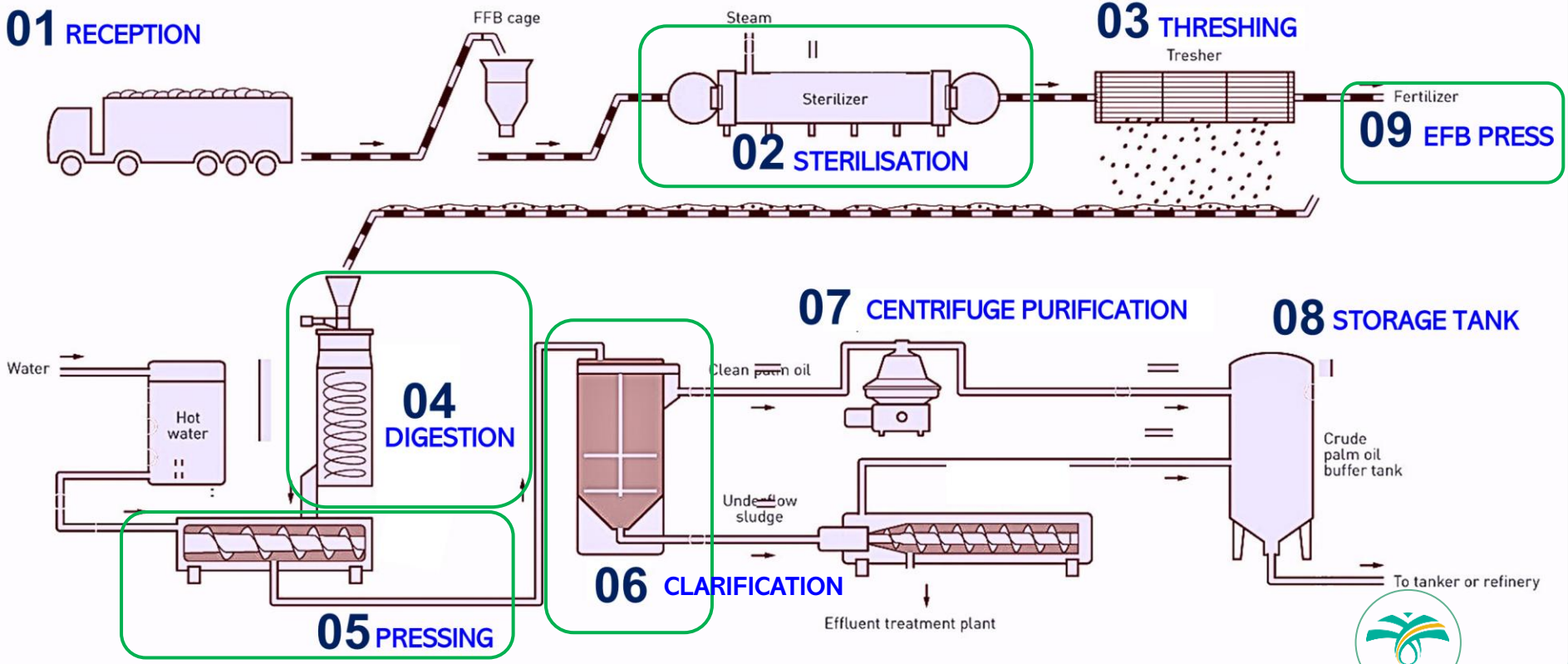
Minyak Mineral Hidrokarbon

Minyak Mineral Hidrokarbon Dalam Rantaian Sawit

- Terdiri daripada minyak mineral hidrokarbon tepu (MOSH) dan minyak mineral hidrokarbon aromatik (MOAH)
- Punca pencemaran
  - Minyak pelincir
  - Minyak hidraulik
  - Gris
  - Diesel



Titik Kawalan Kritikal (CCP) Minyak Mineral Hidrocarbon (MOH)

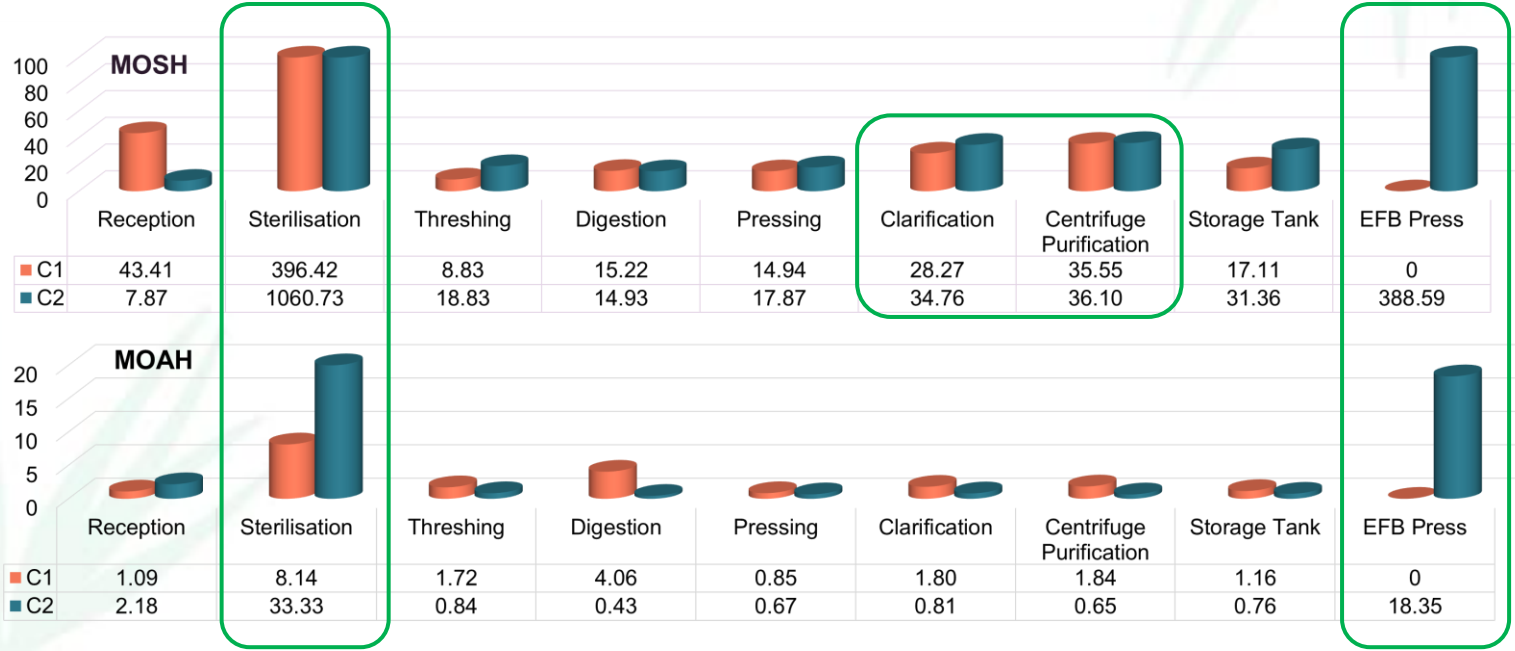


Kawalan Minyak Mineral Hidrokarbon

- Penggunaan *food-grade lubricant*
- Pencegahan kebocoran minyak mesin
- Kawalan bahan pembungkusan

Nestlé	Max level (applicable 01.07.2020)		
	Palm oils and Coconut oils	Other vegetable oils and Animal Fats including Fish oils	Infant Grade ingredients ****ALARA**
MOSH	< 20 mg/kg oil	13 mg/kg oil	< 10 mg/kg oil
MOAH	< 2 mg/kg oil	<LOQ mg/kg oil*	< 2 mg/kg oil

Kandungan MOSH/MOAH



	Reception	Sterilisation	Threshing	Digestion	Pressing	Clarification	Centrifuge Purification	Storage Tank	EFB Press
C1	43.41	396.42	8.83	15.22	14.94	28.27	35.55	17.11	0
C2	7.87	1060.73	18.83	14.93	17.87	34.76	36.10	31.36	388.59

	Reception	Sterilisation	Threshing	Digestion	Pressing	Clarification	Centrifuge Purification	Storage Tank	EFB Press
C1	1.09	8.14	1.72	4.06	0.85	1.80	1.84	1.16	0
C2	2.18	33.33	0.84	0.43	0.67	0.81	0.65	0.76	18.35

Implikasi Kepada Industri Sawit Negara

- Reputasi serta keyakinan pengguna
- Akses pasaran EU dan antarabangsa
- *Sustainability, acceptability & compliance*

Kesimpulan

- Pembentukan bahan cemar 3-MCPDE dan GE serta pencemaran MOH boleh dikawal
- Kawalan perlu bermula dari peringkat kilang buah seterusnya kilang penapis
- Pemain industri perlu proaktif dan berani untuk mengambil langkah-langkah pencegahan
- MPOB sedia membantu pemain industri berdepan cabaran masa kini dan masa hadapan

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