

A food safety control system for oils and fats supply chain

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System lay-out



1. **Supply chain risk assessment visits**
2. **Crude oil analysis for presence of contaminants**
3. **Crude oil risk matrix**
4. **A hazard and quality control analysis of the oil processing operations (design HACCP and link tables)**
5. **Fully refined oils and fats supplier audits**
6. **Monitoring of contaminants in refined oil.**

Supply chain risk assessment method

Assess in actual supply chains:

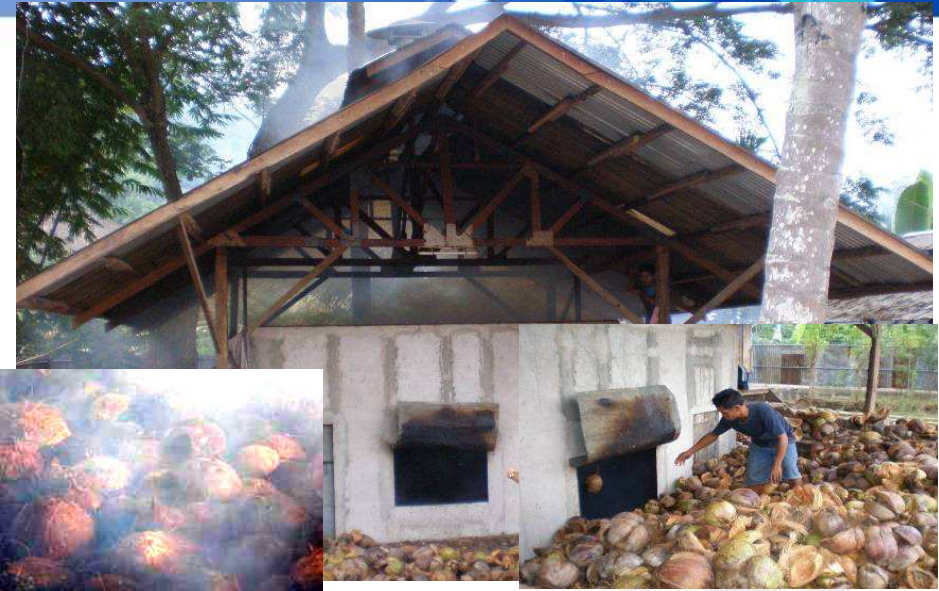
- **Agricultural practices**
- **Actual used crop protection chemicals and fertilizers**
- **Harvesting, oil crop transport and storage.**
- **Oil crop grading and/or analysis**
- **Oil crop drying methods**
- **Oil milling practices**
- **Crude oil storage and transport**

Supply chain risk assessment – main results

Supply Chain risks observations:

■ Poly Aromatic Hydrocarbon absorption from smoke during drying of:

- copra (dried white flesh of coconuts)
- sunflower seeds
- soybeans



■ Use of insecticides to protect sunflower seed, rape seed and soybeans during storage.

■ Aflatoxin formation if copra is insufficiently dried.

■ Leaking of lubricant and hydraulic oils on palm fruit

■ Overseas transport of tropical oils in chemical tankers

Crude oil analyses Unilever



Crude oils bought by Unilever for own or toll refining in North West Europe in the period 01/2001 – 12/2004.

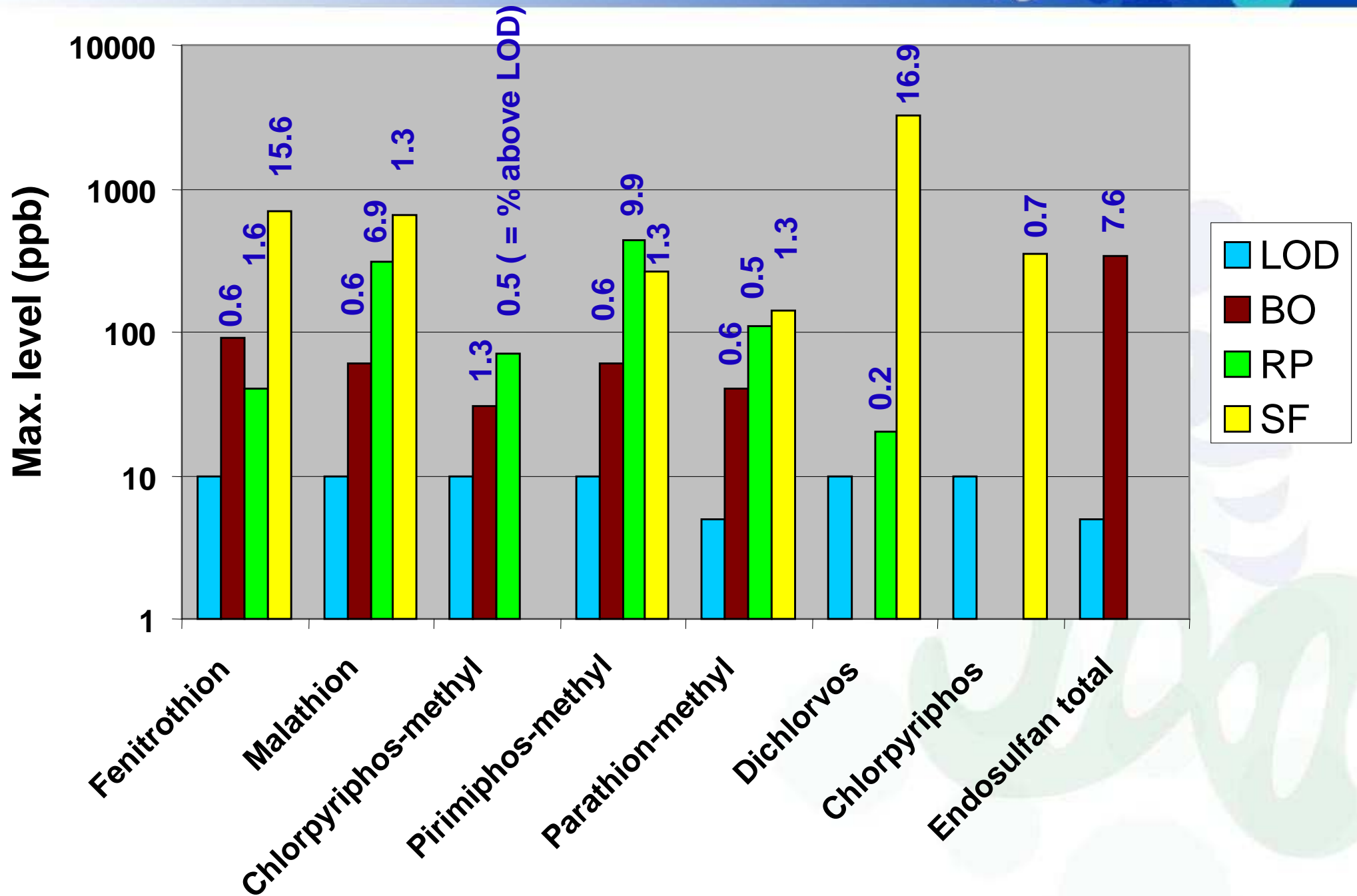
Oils analysed:

| | |
|-----------------|---------------------|
| Rapeseed oil: | 566 samples |
| Sunflower oil: | 154 |
| Soybean oil: | 157 |
| Palm oil: | 318 |
| Palmkernel oil: | 236 |
| Coconut oil: | 164 |
| TOTAL: | 1595 samples |

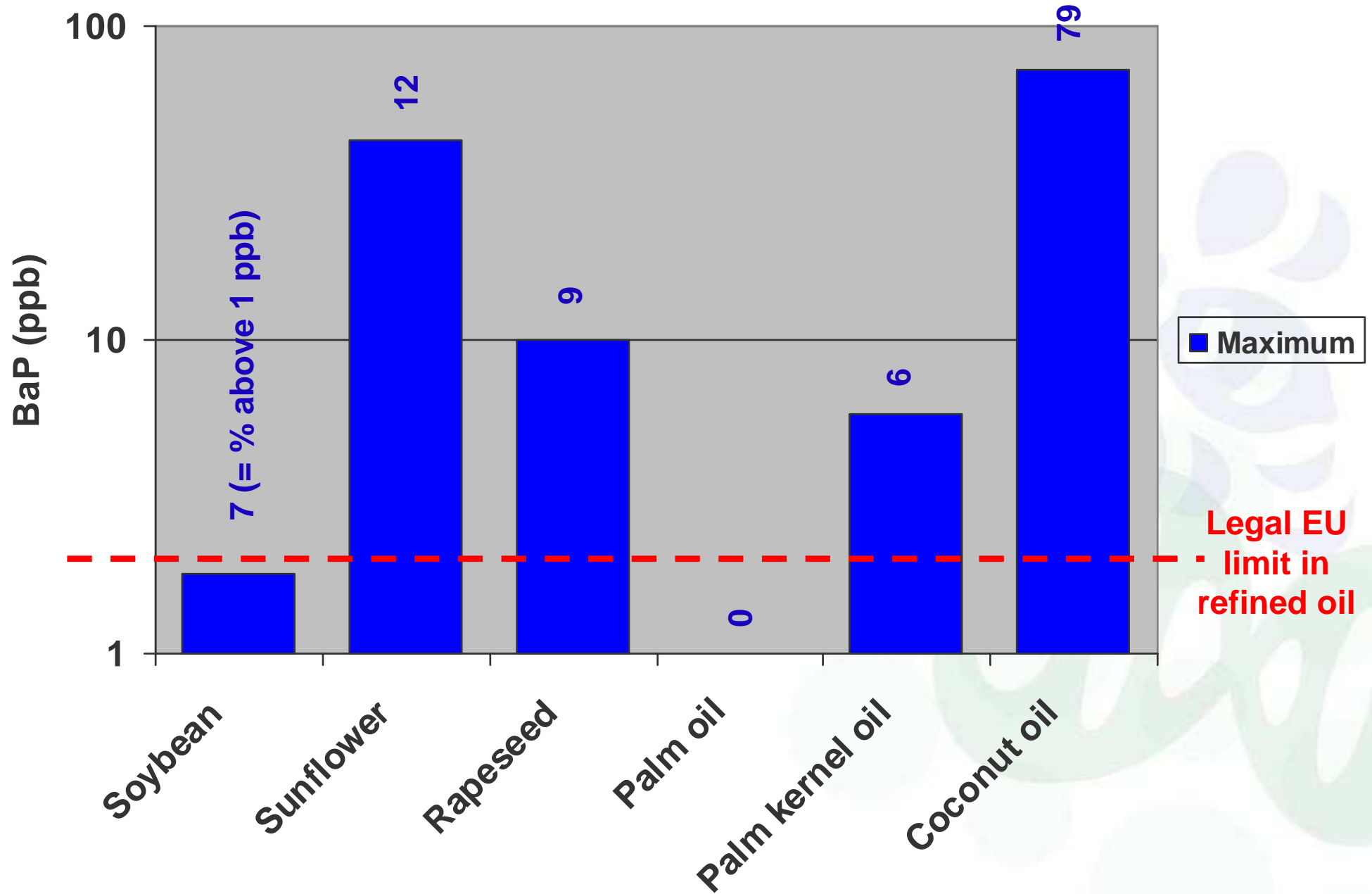
Analysed by Laboratory Verweij on:

- Benz(a)pyrene
- Mineral oil
- 24 Chlor based pesticides
- 28 Phosphor based pesticides
- 9 Nitrogen based pesticides
- 4 Pyrethroids

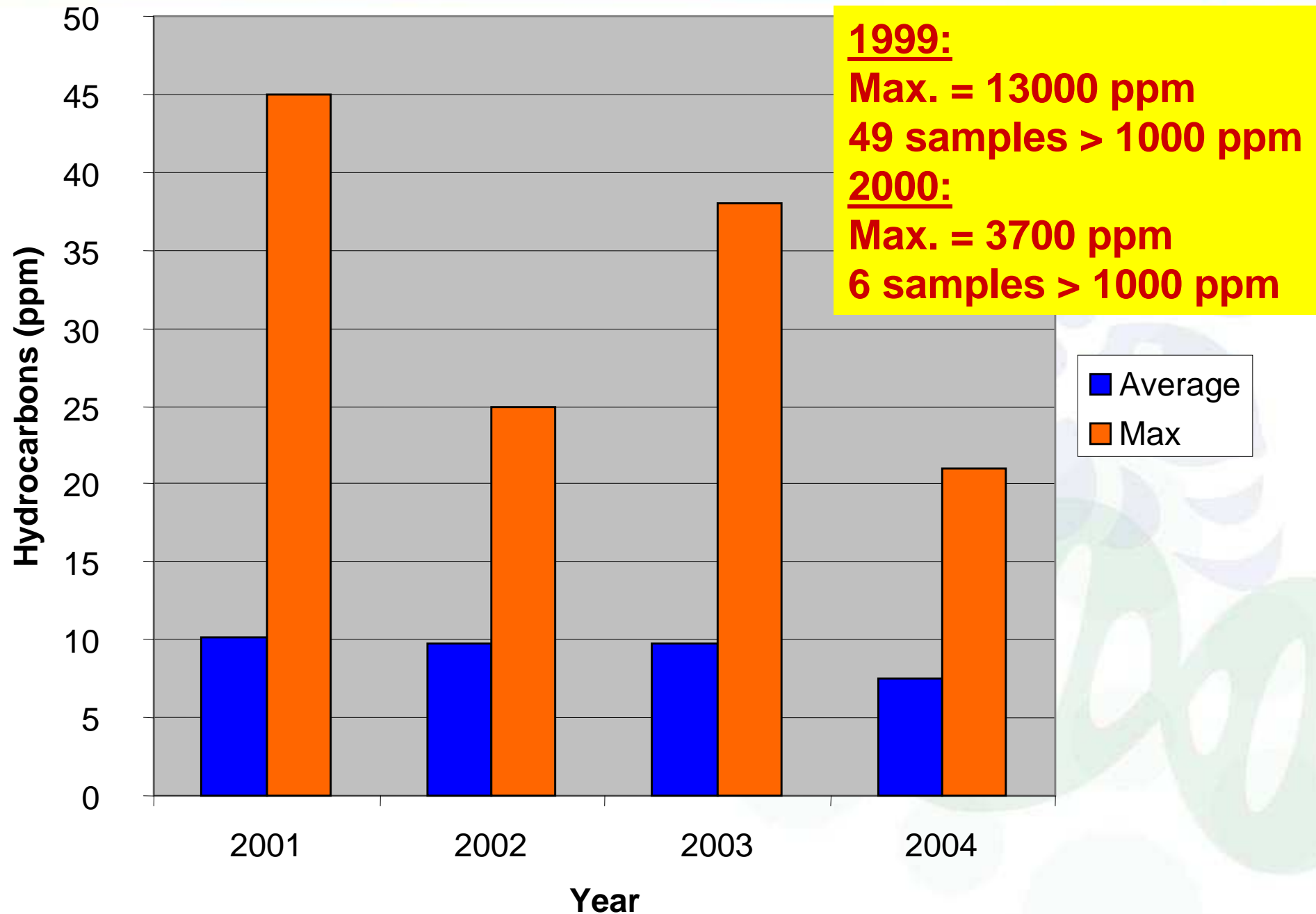
Pesticides in crude seed oils



Benzo(a)Pyrene levels



Hydrocarbons in Palm Oil



Crude oil risk matrix

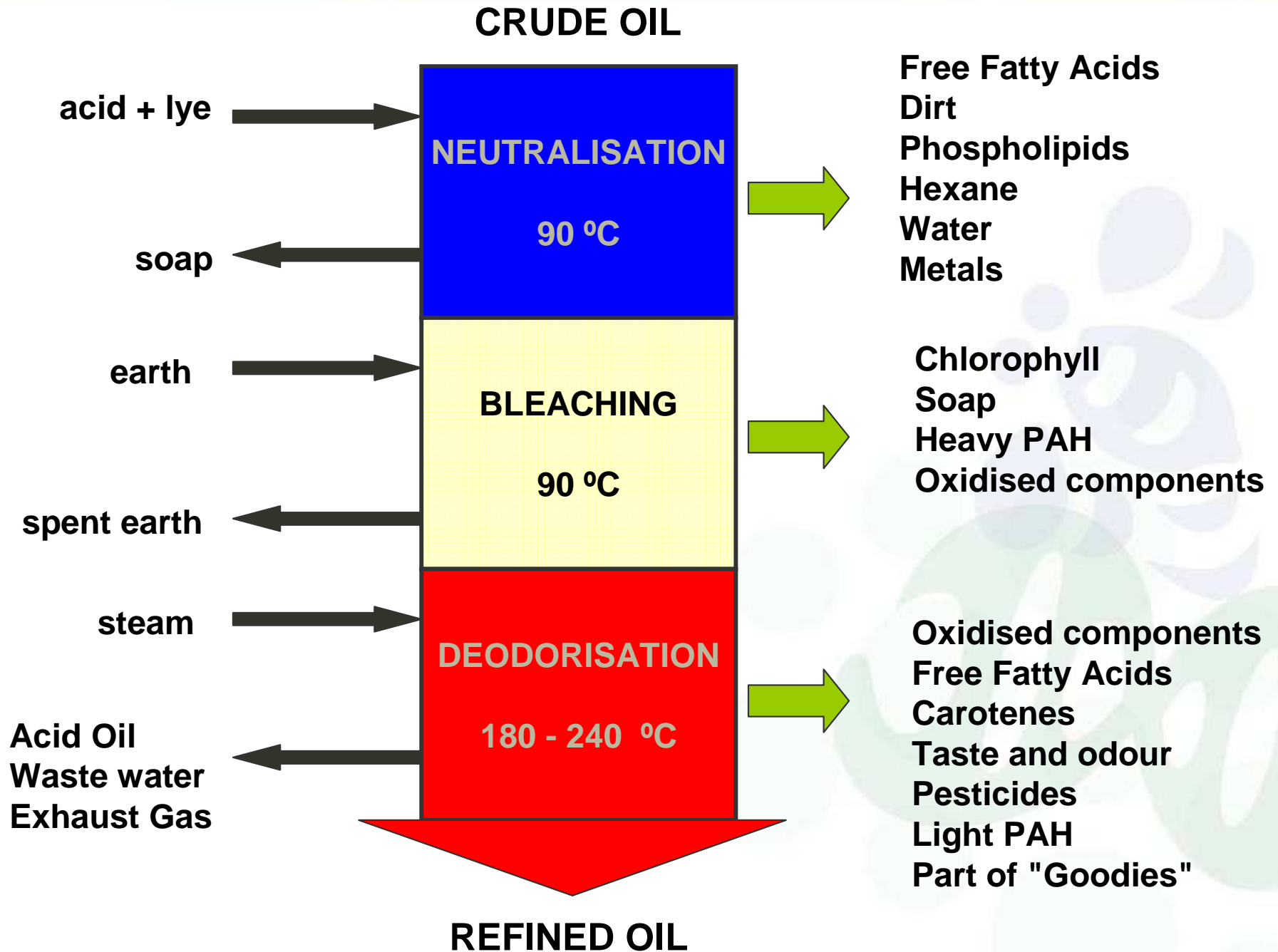


| | Pesticides | PAH | Mineral Oil | Mycotoxins | Previous Cargoes |
|-----------------|------------|------------|-------------|------------|------------------|
| Soybean oil | Yellow | Yellow | Light Blue | Light Blue | Light Blue |
| Sunflower oil | Red | Red | Light Blue | Light Blue | Yellow |
| Rapeseed oil | Yellow | Yellow | Light Blue | Light Blue | Light Blue |
| Palm oil | Light Blue | Light Blue | Red | Light Blue | Red |
| Palm kernel oil | Light Blue | Yellow | Yellow | Light Blue | Red |
| Coconut oil | Light Blue | Red | Yellow | Yellow | Red |

 = *high risk*  = *medium risk*
 = *low risk*



The refining process



Refining link table – Food safety



| | Pesticides | PAH | Mineral Oil | Mycotoxins | Previous Cargoes | Foreign bodies |
|-----------------------------------|------------|---------|-------------------------------|------------|--------------------|----------------|
| Crude oil reception | | | Refused if above agreed limit | | Must be on EU list | |
| Degumming | | | | | | |
| Neutralization | | | | | | |
| Bleaching | | Removed | | | | |
| Deodorization | Removed | Removed | Refused if above agreed limit | Removed | | |
| Refined oil storage and transport | | | | | | Removed |

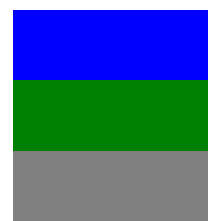


- = *Removed*
- = *Refused if above agreed limit*
- = *Must be on EU list*

Refining link table – Quality



| | Free Fatty Acids | Peroxides | Phosphorus | Dirt | Metals | Taste | Colour |
|-----------------------------------|------------------|-----------|------------|------|--------|-------|--------|
| Crude oil reception | | | | | | | |
| Degumming | | | | | | | |
| Neutralization | | | | | | | |
| Bleaching | | | | | | | |
| Deodorization | | | | | | | |
| Refined oil storage and transport | | | | | | | |



= *Chemical refining*

= *Physical refining*

= *Both chemical and physical*

Refined oil supplier audit system



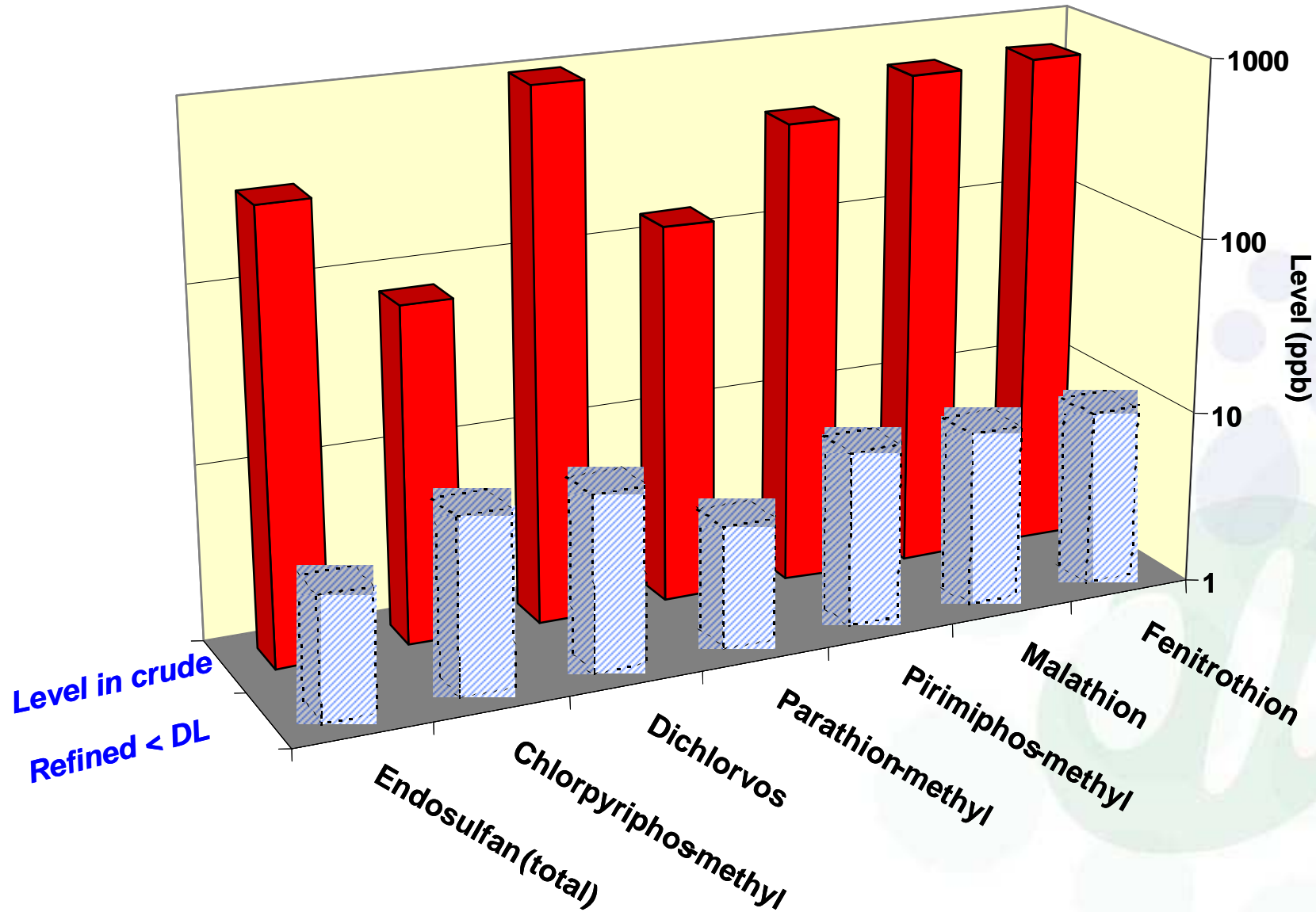
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| | |
|------------------------|--|
| Based on: | Corporate social responsibility General Unilever supplier requirements Good Practice document oil supply Design HACCP |
| Carried out by: | Unilever audit team |
| Initiated by: | Unilever |
| Valid for: | Unilever |

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|------------------------|--|
| Based on: | International food safety standard Specific standard Oil Processing |
| Carried out by: | Approved audit company |
| Initiated by: | Supplier |
| Valid for: | All customers |

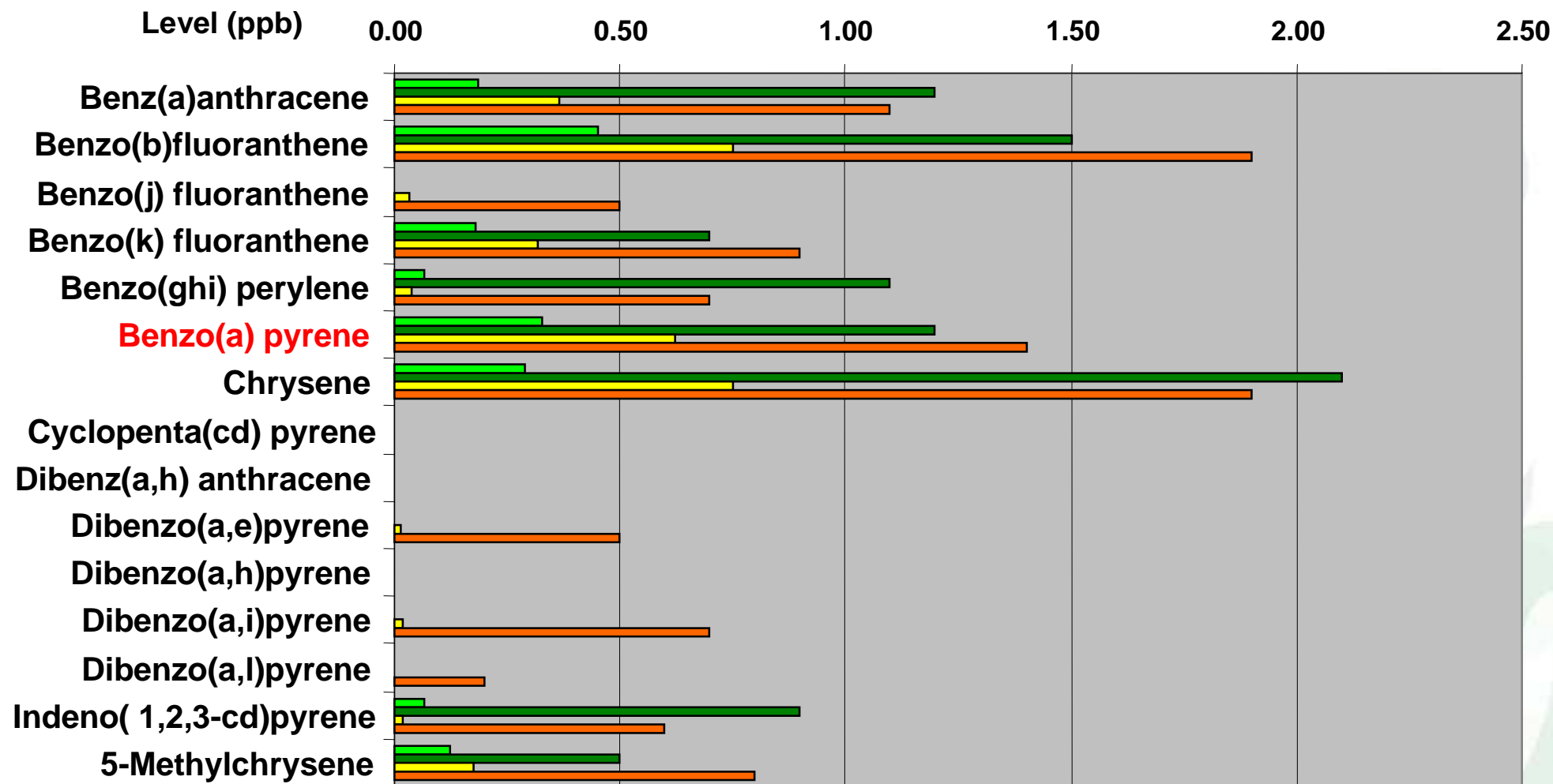
Refined oil - Pesticide removal



Refined oil monitoring - PaH profile



Sunflower oil: 26 samples, Rapeseed oil: 34 samples
From various suppliers and all over Europe.



■ Sunflower Average
 ■ Sunflower Max
 ■ Rapeseed Average
 ■ Rapeseed Max

Summary



- **Crude oil risk matrix based on supply chain assessment and crude oil analyses**
- **Link table to link contaminant and removing process step as bases for HACCP**
- **Audit system to select and improve refined oils and fats suppliers → international standard**
- **Monitoring to check effectiveness of the system**