

Importance of analytics and technology in reducing contaminants



Frank Möllering
Head of Research &
Development
Nutriswiss

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Swiss-based Nutriswiss AG specialises in refining high-quality fats and oils using a combination of mild physical refining processes to eliminate or significantly reduce contaminants while optimising taste. After treatment, the oils are virtually free from unwanted components like pesticides or toxins, and have notably reduced MOSH/MOAH levels. In order to supply industrial customers with efficient and sustainable results even more quickly, the company is systematically expanding its in-house analytical capabilities.

Fats and oils have to be refined in order to remove contaminants, volatile compounds and unwanted byproducts that affect oil quality, shelf life and palatability. These include pesticides, herbicides, insecticides, plasticiser impurities and mineral oil saturated and aromatic hydrocarbons (MOSH/MOAH). Nutriswiss is a specialist in the purification of oils and fats, and refines a wide



The Nutriswiss team develops a customised refining strategy for each raw material depending on the composition of individual fats and oils.
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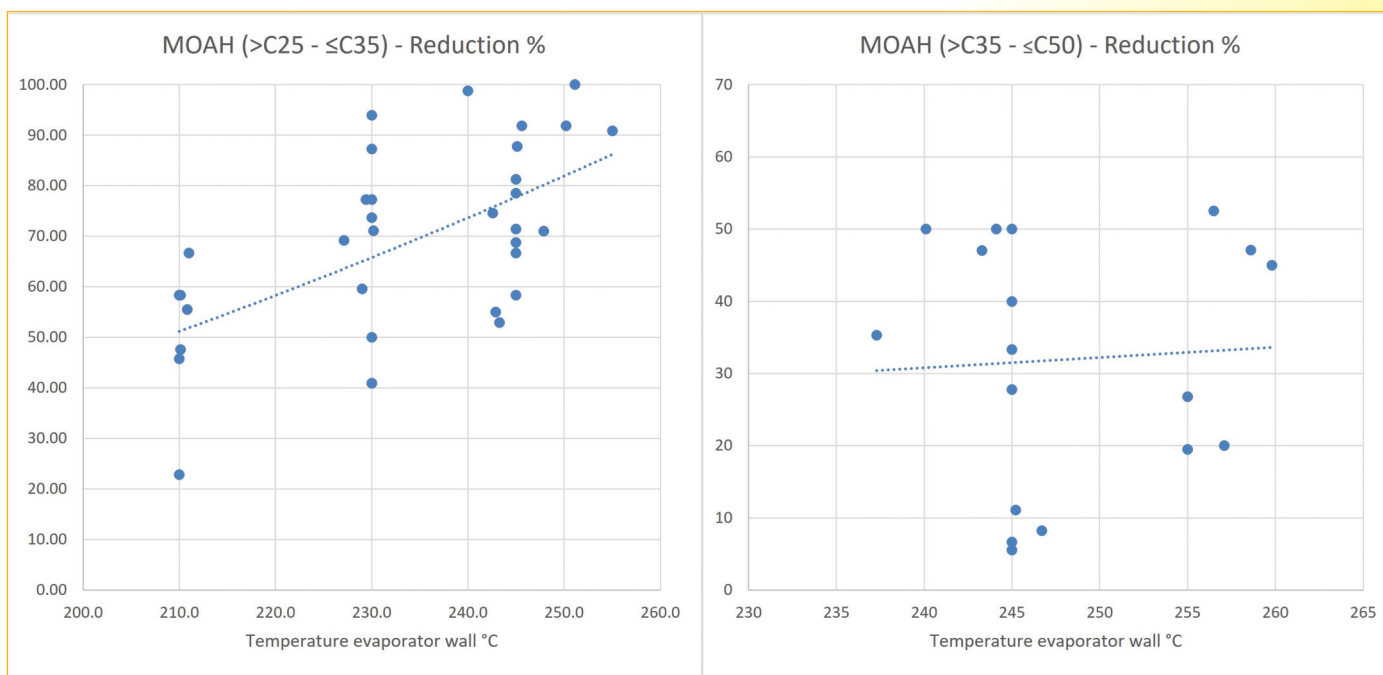


Thanks to mild refining methods, Nutriswiss is already achieving results below expected future MOAH limits.
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range of oils for the food, pharmaceutical and cosmetic industries. Its state-of-the-art processes are also effective in reducing contaminants. As the treatment demands of raw materials vary greatly, all processes must be kept as flexible as possible. This allows Nutriswiss to get the best out of each starting material and meet the exact analytical and sensory properties necessary for the required end product. Innovative and gentle process steps have been integrated to reduce MOSH, MOAH and other unwanted residues. At the same time, valuable ingredients are protected and yield losses are minimised. In this way, oils that would be of limited suitability for further processing or trade due to intense flavour, colour or exposure to environmental and transport contaminants, become safe ingredients.

Quality monitoring from source to end product

When it comes to raw materials, the quality of fats and oils starts at source, as pollutants can be introduced from the environment during cultivation or further along the chain during transport and storage. Contaminants such as pesticides regularly find their way into plants and their seeds, and they can also easily absorb MOAHs from the environment, e.g. from exhaust fumes,



The MOAH fraction >C25 to ≤C35 can be expected to be reduced by about 70% and the fraction >C35 to ≤C50 by approximately 30%

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tyre abrasion or machine lubricating oil. Tropical products such as coconut oil, palm oil, shea butter, cocoa butter etc. usually enter Europe by sea. By the time they arrive, the raw materials have already been pumped into other tanks and ships several times. Open loading processes and contact with pipes, ambient air and other transported goods can lead to the accumulation of harmful substances in the raw material. Due to their chemical structure and lipophilic properties, MOAH, for example, easily accumulate. In addition, contact with oxygen causes oil to oxidise and become rancid. To avoid any negative impact on the product, Nutriswiss has established its own very strict standards. Raw materials for Nutriswiss are responsibly sourced and filled into ISOTAINERS in the country of origin in accordance with food-grade standards, sealed and then transported directly to the refining plant in Lyss, Switzerland.

No EU limits for hydrocarbons... yet

As there are no specific maximum levels for MOSH in food at EU level, and the formal EU

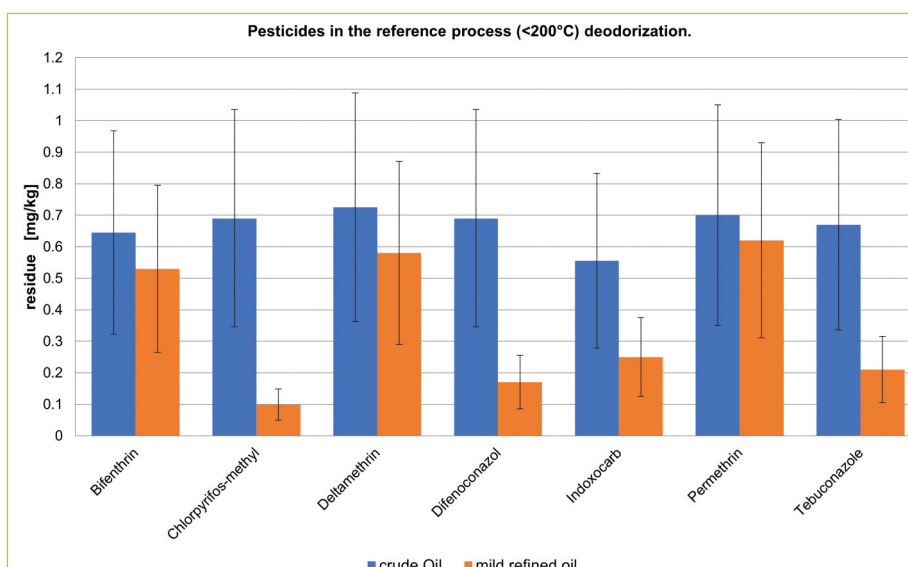
regulatory process is still underway for MOAH, practical enforcement follows the Technical Report "Guidance on sampling, analysis and data reporting for the monitoring of mineral oil hydrocarbons in food and food contact materials" published by the EU Commission's Joint Research Centre (JRC). For oils and fats, it specifies a MOAH guidance value of 2mg/kg. In addition, it sets a MOAH value of 0.5mg/kg for dry foods with a low fat/oil content (up to 4%) and up to 1mg/kg for foods with a higher fat/oil content (more than 4%). Several scientific studies indicate that aromatic mineral oils are potentially carcinogenic and mutagenic. In the Nutriswiss laboratory, a comprehensive profile is created for each oil before, during and after processing. This means that the self-sourced materials are significantly less contaminated on arrival at the plant than standard market goods, which is also reflected in the MOAH values. In supply chain management, Nutriswiss relies on long-term contractual partners, logistics in ISO containers according to food grade standards and its own controls to ensure the highest raw material quality.

Enhanced and innovative analytics

Thanks to its own sourcing and innovative processes, Nutriswiss converts contaminated oils into safe food. Independent laboratory analysis shows MOAH values close to the detection limit after refining. For the removal of MOAH, Nutriswiss does not use time- and temperature-intensive processes. Instead, it relies on physical treatment using modern distillation technology followed by mild deodorisation. This prevents the formation of process contaminants, thus reducing the content of MOSH/MOAH, pesticides, PAH and plasticisers such as DEHP.

The quantitative determination of mineral oil hydrocarbon contamination in food is highly complex and is therefore often outsourced by industrial in-house laboratories to external laboratories, which means it can take up to 10 working days for results. This leads to higher analysis costs, increased logistical effort in sample preparation and dispatch, customs-related hurdles and the need for larger raw material buffers, and associated storage costs. But this approach was not viable for Nutriswiss AG, as Frank Möllering, Head of Research and Development, explains: "One of our major advantages as a specialist provider is our ability to quickly offer concrete solutions to customers in the food industry. To do this, we need rapid analysis results for our raw materials and the further development of our refining processes."

Furthermore, the three-stage safety concept encompasses analysis of supplier samples prior to dispatch, comprehensive incoming goods inspections and stage-by-stage checks throughout the refining process, through to the finished end product. To enable faster and more effective analysis, Nutriswiss has invested in its own online HPLC-GC-FID system, which allows for precise in-house analysis of MOSH/MOAH residues in oils and fats. This expansion significantly enhances Nutriswiss's ability to support customers with highly sensitive applications such as algae-based oils and infant formula. The HPLC-GC-FID system combines high-performance liquid chromatography (HPLC) with gas chromatography (GC). The HPLC-GC system is used for the automated purification and pre-separation of the sample,



Pesticide levels are significantly lower after treatment with mild refining

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which must first undergo a complex purification process. The fraction emerging from the HPLC after pre-separation is prepared for GC by the evaporation of a large proportion of the solvent. It is then mixed with carrier gas and transferred to a pre-column, where a significant amount of the solvent evaporates and is vented. Only then can the content of mineral oil hydrocarbons be quantified in the downstream GC column with a flame ionisation detector (FID).

Laboratory Manager Michèle Béatrice Suter points out the key benefit of in-house analytics: "By eliminating the need for external testing, we can deliver faster turnaround times and offer our customers in the health supplement sector greater flexibility, safety and assurance – particularly when it comes to product compliance and batch-specific quality guarantees." Faster access to information provides a precise basis for decision-making regarding further process control, and allows process parameters to be specifically adjusted.

Gentle refining leads the way

Modern distillation technology efficiently removes or significantly reduces contaminants in fats and oils, but it is important that product quality remains stable or is even improved compared to typical refining processes. Nutriswiss has therefore carried out extensive tests to determine the ideal process parameters for balancing purification and quality targets. With this technology, volatile components such as pesticides and other contaminants evaporate more easily under

low thermal stress, while the stability of the oils is protected. However, this requires extensive know-how and many years of experience. Unlike conventional physical refining at high temperatures, which creates process contaminants and destroys valuable micronutrients, the thermal load in "mild refining" processes remains comparatively low. That means the process is also suitable for sensitive raw materials such as omega-3-rich seed oils such as rapeseed and linseed, algae and other speciality oils.

Producers and processors of vegetable oils are being confronted with ever-stricter legal limits, reflecting the political and social endeavour to achieve the highest possible levels of food safety. Nutriswiss believes that a legal framework is important to ensure that all parties in the supply chain play their part in reducing harmful substances. With its gentle physical refining methods, Nutriswiss is already well prepared for expected stricter limits for MOSH and MOAH in oils and fats.

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