Information note: Printing inks containing mineral oil in paper and board packaging

BACKGROUND

Many years ago, monitoring of packaging and foods in Europe identified mineral oil contamination in a range of packaged foods. Mineral oils[1] are widely used and ended up in foodstuffs by various routes. Since then, almost all sectors of the food industry as well as laboratories and packaging supply industry have been concerned with the presence of mineral oils and have investigated their origin. As a result, industry has gained a comprehensive understanding of the different sources of mineral oil contamination.[2] Many measures for the reduction of the transfer and occurrence of undesired mineral oils that have already been taken show objectively measurable success.

There are many different routes by which contamination of foodstuffs with mineral oils can occur. Food packaging has been identified as one of these potential sources. For instance, mineral oil can migrate from recycled paper and board.

In several EU Member States, the food packaging chain was called to take measures such that levels of mineral oil in foodstuffs were reduced. The European Commission has issued a recommendation[3] on the monitoring of mineral oil hydrocarbons in food and in materials and articles intended to come into contact with food since 2017 and is currently working on a regulation regarding mineral oil residues in food.

In this respect, the European trade associations representing the paper industry (CEPI) and the paper converting industries (CITPA) have recommended to their members to only use mineral oil-free printing inks on paper and board packaging. Additionally, the food industry is recommending that only mineral oil-free inks that are optimized for migration are used for food packaging

For many years EuPIA members offer mineral oil-free inks for food contact materials and articles and recommend that only those inks are used for such applications.

To enable printers and converters to meet their respective industry association's commitment, EuPIA has identified appropriate packaging ink options.

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[1]There are different definitions of Mineral Oils in the literature. For the purposes of this initiative, EuPIA defines mineral oil as follows: Mineral oils are petroleum derived substances, produced by refining crude oils. They are manufactured by atmospheric and vacuum distillation (at temperatures between ~300°C and ~700°C) of crude oil and are then further refined. They consist of complex mixtures of hydrocarbon molecules of different size (20 to 30 carbon atoms) in which the carbon chains are linear, branched and/or cyclic. Types of mineral oils may be characterized by their content of paraffinic, naphthenic and/or aromatic structures. Mineral oils classified as carcinogenic according to CLP regulation are not used by EuPIA members in accordance with the EuPIA Exclusion Policy. Mineral oils have to be distinguished from waxes and hydrocarbon solvents. Hydrocarbon solvents have a different manufacturing process which distinguishes them from mineral oil, with their chain lengths up to C20. The terms MOSH, MOAH, POSH, etc are terms used to describe various components seen in chromatography, and do not necessarily align with the hydrocarbon derivatives used as raw materials.
[2] Food Drink Europe "Toolbox for Preventing the Transfer of Undesired Mineral Oil Hydrocarbons into Food" 2018, https://www.fooddrinkeurope.eu/resource/preventing-transfer-of-undesired-mineral-oil-hydrocarbons-into-food/
[3]Commission recommandation (EU) 2017/84

MINERAL OIL FREE PACKAGING INK OPTIONS

Sheetfed offset printing

Sheetfed Printing inks for food contact materials (FCM inks) sometimes addressed as "low migration ink" or "food packaging inks", are manufactured according to GMP. They are formulated without mineral oils and usually based on vegetable oils, vegetable oil esters or, in case of UV curable sheetfed inks, on synthetic reactive diluents and resins and are optimized to the lowest possible content of any unevaluated migratory substances. As raw materials are specially selected, the levels of trace impurities are significantly lower compared to standard inks.

For more information, please consult the EuPIA customer information note regarding the use of sheetfed offset inks and varnishes for the manufacture of food packaging (www.eupia.org).

Flexographic printing

Flexographic inks for paper and board are usually water based or UV curable and are therefore typically free of mineral oils. For food packaging applications, specially formulated flexographic inks are recommended.

Digital printing

Digital printing inks for the different digital printing technologies (inkjet, electrophotography, magnetography) can be water based, UV cured, solvent free or solvent based and are also typically free of mineral oils.

OTHER ASPECTS TO CONSIDER

The recycled paper or board itself could also be a relevant source of mineral oil: the wastepaper from which it is made might contain a significant proportion of used newspapers. Although mineral oil free ink sets are also available, inks for printing newspaper (news inks) typically contain mineral oils as an important part of the formulation, which upon printing are absorbed by the paper (this is how printed news inks dry). Thus, mineral oils may come into direct contact with foodstuffs as substances contained within the recycled paper and board, unless the packaging is designed in such a way that transfer of the mineral oil is avoided.
This applies even if the paper and board had been printed with printing inks supplied by EuPIA members, and the raw materials for the manufacture of these inks were selected according to the criteria of the EuPIA Exclusion Policy for Printing Inks and Related Products. Inks under the EuPIA Exclusion Policy inks do not contain carcinogenic raw materials and hence all mineral oils used fulfil the IP346 test[4], which means that they have a very low content of the hazardous 3–7 ring polycyclic aromatic compounds.[5]

This is important, since the European Food Safety Agency (EFSA) concluded in an update to the risk assessment 2023[6] that the present dietary exposure to Mineral Oil Saturated Hydrocarbons (MOSH)

[4] IP 346: Determination of polycyclic aromatics in unused lubricating base oils and asphaltene free petroleum fractions - Dimethyl sulphoxide extraction refractive index method
[5] https://www.concawe.eu/wp-content/uploads/Comparison-of-PAC-and-MOAH.pdf
[6] Update of the risk assessment of mineral oil hydrocarbons in food, EFSA 2023, https://efsa.onlinelibrary.wiley.com/doi/abs/10.2903/j.efsa.2023.8215

does not raise concerns for human health, as the only relevant concern comes for the 3- or more aromatic ring Mineral Oil Aromatic Hydrocarbons (MOAH).

However, with very few exceptions, printing inks intended for graphic, general packaging and food packaging applications are not designed to come into direct contact with food and therefore, the raw materials used in printing inks do not generally meet food packaging standards.

This observation is not new, and therefore the ink industry has long advised caution when using recycled paper and board as food packaging.

Under these circumstances, **it is the responsibility of those placing recycled paper and board on the market for food packaging purposes to assess any risks associated with this use**. Where necessary they should take appropriate measures to ensure that any transfer of substances from the packaging to the foodstuff occurs below acceptable levels, compliant with the requirements of Framework Regulation (EC) No 1935/2004.

In this context, EFSA has already stated in its Scientific Opinion from 2012 on Mineral Oil Hydrocarbons in Food[7]:

"MOH [Mineral Oil Hydrocarbons] contamination of food by the use of recycled paperboard as packaging material may be a significant source of dietary exposure. It can be effectively prevented by the inclusion of functional barriers into the packaging assembly. Other measures may include segregation of recovery fibre sources intended for recycling and the increasing of the recyclability of food packages by avoiding the use of materials and substances with MOH in the production of food packages."

Due to the fact that the paper recycling stream is highly international, national measures can only be expected to have a very limited effect.

CONCLUSION

Mineral oil-free inks for food contact materials and articles are available.
Caution is needed where recycled paper and board is used. The manufacturer of those recycled material is responsible for assuring no migration when food contact is intended.

Paper Recycling TF/ETC 11/2025

[7] EFSA Panel on Contaminants in the Food Chain (CONTAM); Scientific Opinion on Mineral Oil Hydrocarbons in Food. EFSA Journal 2012;10(6):2704. [185 pp.] doi:10.2903/j.efsa.2012.2704. Available online: www.efsa.europa.eu/efsajournal