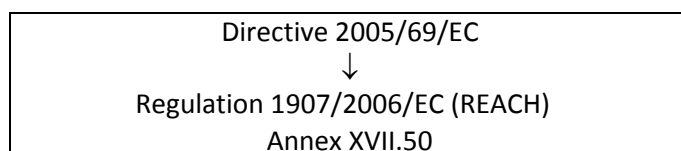


REPLACEMENT OF HIGHLY AROMATIC OILS IN TYRES

This document represents the updated version of the original FAQ developed by ETRMA (former BLIC).
This update reflects the latest regulatory developments.



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1 - HIGHLY AROMATIC OILS

Q1. What are highly aromatic oils? What are they used for in tyres?

Highly aromatic oils are derivatives of the petrochemical industry. Aromatic oils do not have - contrary to their name - the function of conferring a pleasant smell to the tyre. They enter into the composition of tyres because they are required to facilitate the processing of the rubber compounds. They are also an essential component for the technical performance of the tyre and in particular for its road adherence (or grip) properties. They therefore contribute and directly play a part in the quality of the tyre and user safety.

Q2. What are PAHs? Where do they come from?

The presence of polycyclic aromatic hydrocarbons (PAHs) in the environment is primarily due to human activity but can also have a natural origin (forest fires, volcanoes and combustion of organic materials in nature). PAHs are produced by all combustion phenomena: waste incineration, iron and steel production, home barbecues, motor vehicle exhaust, open chimney fires, tobacco smoking, gas cooking, etc... Cigarette smoke, for example, contains PAH, just like cooking and frying smoke.

PAHs are also present in aromatic oils produced by oil refining, and thus also end up as a consequence in tyres. PAHs as such are not a purposeful addition to tyres.

PAHs are present in the air, water and ground. Emissions of PAHs coming from abraded tyre particulates are minor (2%) relative to total PAH emissions in air, water and ground (according to the Opinion from the European Commission Scientific Committee on Toxicity, Ecotoxicity and the Environment (CSTEE) in November 2003).

Q3. Are PAHs carcinogenic?

The European Union has classified eight PAHs as carcinogenic.

They are only harmful to human health in the case of chronic exposure (continuous and very long term), according to the EU Directive which regulates exposure.

Tests with blends of HA oil incorporated into rubber compounds show no carcinogenic effects.

As long as PAHs are physically bound in abraded tyre particles and they are not available in the environment, they have no carcinogenic effect.

Q4. Are PAHs used as a direct material in tyres?

No, PAHs are not used as direct material in the compound, but the process oils purchased for tyre production contain traces of PAHs.

Q5. What is the purpose of highly aromatic oil use?

Highly aromatic oils were added to the rubber compound in the factory during the manufacturing process or added to purchased rubbers to improve the processability of the compounds. Additionally, the tread rubber compound achieves improved performance characteristics, mainly wet grip but also other characteristics like wear and endurance.

Wear has an additional direct impact on the environment as it influences the lifetime of the tyre and reduces used tyres arising to be treated.

Q6. In which categories of tyres were highly aromatic oils originally used before the restriction entered into force?

In all tyre categories.

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Q7. There have been reports saying that highly aromatic oils in tyres are toxic. Is this true?

Certain highly aromatic oils as such are classified carcinogenic because when tested according to IP method (so called IP346, see Definitions) show values exceeding 3%. However, finished rubber products such as synthetic rubber and tyre compounds that were produced using aromatic oils are not categorised by the EU as carcinogenic materials.

Q8. What do the PAHs become when diffused in nature? Do they present a risk for the environment?

In the environment, PAHs degrade more or less quickly according to the specific conditions of the environment. This degradation takes place naturally under the joint action of chemical oxidizers, ultraviolet light and microorganisms.

Everybody should be concerned by exposure to or ingestion of PAHs present in water, the air or in food. However, PAHs in tyre debris are not extracted by water or other materials that are normally present in the environment.

In November 2003, the Scientific Committee on Toxicity, Ecotoxicity and the Environment (CSTEE) concluded that tyre debris contributes marginally to total PAH emissions (2%) and that a reduction of PAHs in tyres will insignificantly reduce overall concentrations in the environment¹.

Q9. What is the contribution of PAHs in tyre emissions versus other sources?

PAH from tyre debris only represents 2% of the total PAH emissions in the air as demonstrated in the Opinion from the Scientific Committee on Toxicity, Ecotoxicity and the Environment (CSTEE) in November 2003.

Making a direct source-to-source comparison illustrates the proportions on a concrete example. Typically in air emission measurement PAH emissions are expressed in BaP concentration. Benzo a pyrene (BaP) is one of the eight regulated PAH's and is chemically detected as a representative species.

Tyre wear contributes with 0.015 ng/m³ of BaP concentration in air. This is a value determined most recently by the German Environmental Agency in Berlin.

For example, smoke of one cigarette generates 22 ng BaP. Entering a medium size room of 15 m² where somebody smokes one cigarette, the exposure to BaP in the air is at concentration of 0.66 ng/m³.

This is an air concentration 44 times higher than the one from tyre wear.

This is an example to illustrate the proportionality. The tyre industry sticks to its precautionary approach and is committed to replace the highly aromatic oils by end of 2009, the earliest possible phase-out date to guarantee safety and environmental performances of tyres.

ng = nanogram = 1 millionth of 1 milligram

Q10. Are the workers handling these oils protected at the workplace?

As a result of safety measures implemented at the workplace for more than 20 years, these oils present no risk for the workers who make and handle the tyres.

¹ We also want to remind that the handling of tyres presents no concern for consumers, employees, and workers in factories and tyre shops.

2 - LEGAL SITUATION IN EUROPE

Q11. What is the legal situation in Europe?

From 1 January 2010, extender oils shall not be placed on the market for use in tyre production if they contain:

- more than 1 mg/kg (0,0001 % by weight) BaP, or,
- more than 10 mg/kg (0,001 % by weight) of the sum of all listed PAHs:
 - Benzo[a]pyrene (BaP) CAS# 50-32-8
 - Benzo[e]pyrene (BeP) CAS# 192-97-2
 - Benzo[a]anthracene (BaA) CAS# 56-55-3
 - Chrysen (CHR) CAS# 218-01-9
 - Benzo[b]fluoranthene (BbFA) CAS# 205-99-2
 - Benzo[j]fluoranthene (BjFA) CAS# 205-82-3
 - Benzo[k]fluoranthene (BkFA) CAS# 207-08-9
 - Dibenzo[a,h]anthracene (DBAhA) CAS# 53-70-3

This restriction applies equally to tyres produced within EU and tyres imported into EU.

This restriction, originally adopted by the European Commission by means of the Directive 2005/69/EC, is now transposed into the European Regulation 1907/2006/EC (REACH), Annex XVII, entry 50.

Q12. What are the tyre categories covered by the ban?

Entry 50 to Annex XVII as enacted by Commission Regulation 552/2009 restricts the use of PAH in tyres for "vehicles covered by Directive 2007/46/EC establishing a framework for the approval of motor vehicles and their trailers". Article 2 of Directive 2007/46 defines its scope:

- Paragraph 1 lists the vehicles designed for use on roads.
- Paragraph 3 of Article 2 lists the following vehicles:
 - vehicles designed and constructed for use principally on construction sites or in quarries, port or airport facilities;
 - vehicles designed and constructed for use by the armed services, civil defence, fire services and forces responsible for maintaining public order;
 - mobile machinery,
- Paragraph 4 of Article 2 lists the following vehicles:
 - vehicles intended exclusively for racing on roads;
 - prototypes of vehicles used on the road under the responsibility of a manufacturer to perform a specific test programme provided they have been specifically.

The restriction in Entry 50 covers the tyres for vehicles listed in the Article 2 para 1, 3 and 4 of Directive 2007/46/EC which have a maximum design speed limit exceeding 25 km/h. Tyres of mobile machinery with a maximum design speed limit exceeding 25 km/h are therefore also covered by the restriction.

Further clarifications are also available in the European Commission Frequently Asked Questions:

http://ec.europa.eu/enterprise/sectors/chemicals/files/reach/restr_faq_jan_2010_en.pdf

Q13. Is the retreading industry concerned with the ban?

Yes, the new tread must be manufactured with "clean" oils meeting the new requirements.

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Q14. Are inner tubes in the scope of the ban?

No, inner tubes are not affected by the marketing restrictions set out in Entry 50 of Annex XVII of REACH.

Q15. Are original equipment tyres fitted on new vehicles manufactured or imported within EU concerned with the substitution?

Yes.

Q16. Are standard reference tyres in the scope of the ban?

“Standard reference tyres” are produced and imported solely for the purpose of providing a reference performance for other newly developed tyres. They are not placed on the market to be fitted on vehicles intended for final users. These tyres are therefore not covered by the provision of the restriction in Entry 50 of Annex XVII.

Q17. What happens to the existing tyre stocks in tyre distribution network at/after the phase out date?

Nothing is foreseen in the proposed directive.

Q18. Are there test methods available for a proper implementation of the proposed Directive?

Yes, tests are available for testing both oils and the finished product (vulcanised rubber):

- **IP346 Oils compliance:** the limits are regarded as kept, if the polycyclic aromatics (PCA) extract is less than 3 % by weight as measured by the Institute of Petroleum standard **IP346:1998** (Determination of PCA in unused lubricating base oils and asphaltene free petroleum fractions — Dimethyl sulphoxide extraction refractive index method), provided that compliance with the limit values of BaP and of the listed PAHs, as well as the correlation of the measured values with the PCA extract, is controlled by the manufacturer or importer every six months or after each major operational change, whichever is earlier.
- **ISO 21461 Tyre compliance:** the vulcanised rubber compounds must not exceed the limit of 0,35 % Bay protons as measured and calculated by **ISO 21461** (Rubber vulcanised — Determination of aromaticity of oil in vulcanised rubber compounds).

Q19. What does “part of tyres” refer to?

The definition of the term “parts of tyres” can be referenced to the EU legislation on type-approval relating to tyres² which defines certain elements as being a “part of a tyre”, i.e., the bead, carcass, tread and sidewall³.

Q20. What does ETRMA think about this restriction?

ETRMA supports this restriction. It followed a voluntary commitment of the European tyre manufacturers in order to secure a level playing field back in June 2003.

A transition from PAH-rich oils to alternative oils (including oil extended polymer production) was a great challenge for industry especially as the grip performance of tyres, and therefore the breaking distance of cars and road safety, could have been negatively affected. This entailed significant efforts including chemical re-engineering, extended laboratory tests and complete tyre tests and homologation, and important changes to the

² Directive 92/23 relating to tyres for motor vehicles and their trailers and to their fitting, EU Official Journal L 129 (1992), p. 25 (as amended).

³ See Annex II (Requirement for tyres), section 2 (Definitions), points 2.4, 2.7, 2.8 and 2.9.

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manufacturing process, considering the new legislative performance requirements on tyres such as wet grip, rolling resistance and noise.

3 - DEFINITIONS

- a. Extender oil, also often referred to as “process or softening oil”, is added to rubber compounds in the production process for tyres and other rubber goods to achieve an acceptable processability. The specific oil may also have an impact on certain performance characteristics of the final product.
- b. Highly Aromatic (HA) oils, also referred to as distillate aromatic extract oils (DAE), are oils with a high amount of aromatic carbon structures and are classified as carcinogenic. These oils contain an increased polycyclic aromatic hydrocarbon content and can thus also be called PAH rich oils. (reason for change: Take out PAH content as reason for DAE carcinogenic classification)
- c. Poly-Aromatic-Hydrocarbons (PAHs): a group of over 100 chemical substances of poly-aromatic structure, that are widely found throughout the environment and formed by both natural and industrial processes. Eight PAHs have been identified as carcinogenic and are regulated by EU legislation.
- d. Treated Distillate Aromatic Extracts (T-DAE): mineral oils, not classified as carcinogenic, as they contain a DMSO extract IP346 inferior to 3% and consequently a reduced PAH content, typically by factor 20-50 lower than HA oils.
- e. IP346 is a standardized test method developed by the Institute of Petroleum and is applicable to the range of oils used in the tyre industry. The method consists in the extraction of three to seven ring polycyclic aromatic compounds through a specific solvent "DMSO Dimethylsulfoxide". The thus obtained extract through IP346, includes the eight PAH's specified by EU legislation, but is not limited to these. IP346 has been accepted as a suitable predictor of the carcinogenic potential for oils as used in the tyre industry and is thus globally accepted by legislators as a tool for classifying and labeling oils. Oils with an IP346 extract content below 3% are not classified as carcinogenic
- f. ISO 21461 is a standardised method for the selective determination of polyaromaticity of oil in vulcanized rubber compounds. The method is based on nuclear magnetic resonance (NMR) spectrometry