GUIDANCE SHEET

POLYCYCLIC AROMATIC HYDROCARBONS (PAHs)/NAPHTHALENE

Class or Substance Name

Polycyclic Aromatic Hydrocarbons (PAHs): Polyaromatic Hydrocarbons

Substance List by CAS Number

PAHs are a large class of substances. The PAHs subject to restriction include:

50-32-8	Benzo[a]pyrene	**207-08-9**	Benzo[k]fluoranthene
120-12-7	Anthracene	**208-96-8**	Acenaphthylene
129-00-0	Pyrene	**218-01-9**	Chrysene
191-24-2	Benzo[ghi]perylene	**53-70-3**	Dibenz[a,h]anthracene
192-97-2	Benzo[e]pyrene	**56-55-3**	Benzo[a]anthracene
193-39-5	Indeno[1,2,3-cd]pyrene	**83-32-9**	Acenaphthene
205-82-3	Benzo[j]fluoranthene	**85-01-8**	Phenanthrene
205-99-2	Benzo[b]fluoranthene	**86-73-7**	Fluorene
206-44-0	Fluoranthene	**91-20-3**	Naphthalene

Description of Use in Apparel and Footwear

PAHs are naturally occurring substances in fossil fuels and may be formed during incomplete combustion of organic materials. Oils contaminated with PAHs may be used as softeners or extenders in rubber and plastic. PAHs also may be formed by thermal decomposition of recycled materials during reprocessing and may be present as impurities in carbon black pigments and dyestuff.

Naphthalene is often present as an impurity from raw materials used as intermediates in the production of textile dye dispersing agents and may be found in textiles.

Legislation around the world, including new legislation in the EU[1], restricts several PAHs in apparel, footwear and accessories. Leading apparel and footwear brands have banned the use of certain PAHs in production of their products.

PAHs MAY BE FOUND IN:

- Rubber/Plastic Components
- Footwear Outsoles
- Lacquers and Coatings
- Recycled Materials
- Carbon Black Pigments/Dyestuff
- Extender Oils/Softeners
- Lubricants
- Printing Pastes

NAPHTHALENE MAY BE FOUND IN:

- Dye Dispersing Agents
- Textiles

Why are PAHs Restricted?[2]

- Some PAHs can be very toxic to aquatic organisms and above certain exposure levels may cause long-term adverse effects in the aquatic environment.
- Above certain levels, long-term exposure to some PAHs may result in the development of particular cancers.
- Some PAHs, above certain exposure levels, may impair human fertility or cause harm to unborn children.

Guidance: Sourcing PAH-Compliant Materials from Your Material Suppliers (Textiles, Components and Trim Parts)

- Contact your suppliers and explain that you require materials with a sum of all listed PAHs <10 ppm (0.001%) and benzo[a]pyrene, CAS 50-32-8, <1 ppm (0.0001%).[3]

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[1] Beginning December 2015, Regulation (EU) No 1272/2013 restricts eight PAHs in accessible plastic and rubber parts to <1 ppm each in adult products and <0.5 ppm each in toys and childcare articles.

[2] Classification and risk phrases according to European Union Council Directive 67/548/EEC or Directive 1999/45/EC.

[3] Limits taken from AFIRM Restricted Substances Guidance (http://www.afirm-group.com/rsl-guidance/). These are the lowest agreed upon limits on PAHs in products among AFIRM brands. Check with brands for their individual limits.

  - This includes rubber and plastic components as well as lacquers and coatings since PAHs are common residues in oils used as softeners and extenders.
  - Pay special attention to rubber and plastic materials used in footwear outsoles since they make wide use of extender oils that may contain PAHs.
  - Recycled plastic and rubber materials are at greater risk of containing PAHs due to thermal decomposition during reprocessing.
  - Consider that materials colored black may incorporate carbon black-based pigments or dyestuffs that can contain high concentrations of PAHs as impurities.
  - Naphthalene may be found in textile materials since it is a residual impurity in dye dispersing agents composed of naphthalene-sulfonic acid polycondensation products.
- Advise your material suppliers to adjust the time and temperature used to process plastic/rubber materials to minimise the risk of PAH formation from thermal decomposition.
- Lubricants used in textile processing may be contaminated with PAHs and can result in materials failing to meet PAH limits; recycled lubricants carry the greatest risk.
- Share this information sheet with your material suppliers and instruct them to work with their chemical suppliers to source PAH-compliant chemical formulations using the guidance in the next section.
- Have your suppliers confirm that their manufactured materials meet the sum of all PAHs (<10 ppm) and benzo[a]pyrene (<1 ppm) limits with a certification or, if necessary, by providing a test report from a third-party laboratory.
- Perform risk-based checks of your suppliers' materials by submitting samples to a third-party laboratory for testing to ensure the sum of all PAHs (<10 ppm) and benzo[a]pyrene (<1 ppm) limits are not exceeded.

Guidance: Sourcing PAH-Compliant Chemical Formulations from Your Chemical Suppliers

- Contact your chemical suppliers and explain that you require chemical formulations with no intentionally added PAHs. The sum of all PAHs in chemical formulations should be <200 ppm (0.02%) and benzo[a]pyrene <20 ppm (0.002%).[4]
  - Pay special attention to suppliers of oils used as extenders or softeners in plastic and rubber materials. Recycled oils carry the greatest risk of PAH contamination.
  - Consider that pigments and dyestuffs based on carbon black may contain high residual concentrations of PAHs.
  - Dispersing agents for textile dyes may contain high residual naphthalene concentrations if they are based on low-quality naphthalene-sulfonic acid polycondensation products.
  - Recycled or low-quality lubricants used for textile processing may contain PAHs.
- Have your chemical suppliers confirm that their chemical formulations meet the PAH limits with a certification or, if necessary[5], by providing a test report from a third-party testing laboratory.
- Perform risk-based checks of your chemical suppliers' formulations by submitting samples to a third-party laboratory for testing to ensure the PAH limits are not exceeded.

[4] Limits taken from ZDHC Manufacturing Restricted Substances List (MRSL) (http://www.roadmaptozero.com/df.php?file=pdf/MRSL.pdf) and are the limits on unintended PAHs in chemical formulations accepted by ZDHC member brands.

[5] At a later date, ZDHC will publish guidance on when testing of chemical formulations is appropriate.

For additional information, contact a ZDHC brand member.