

## Alkylphenols

Alkyl phenols are natural constituents of petroleum oil and may be found in produced water discharged from offshore oil and gas installations. The three alkyl phenols listed for priority action – nonylphenol (NP), octylphenol (OP) and 2,4,6-tri-tert-butylphenol (2,4,6-TTBP) – are used as intermediates in the production of other chemicals. NPs are used to produce NP derivatives, especially ethoxylates, with end uses as emulsifiers, dispersive agents, surfactants and/or wetting agents in various industrial and domestic products. OP is mainly used to produce phenol/formaldehyde resins with various end uses (tackifier in rubber for tyres, water-based paints, pesticide formulations, and recovery of oil in offshore processes). 2,4,6-TTBP may be used in the production of antioxidants for rubber and plastic and as an additive to fuel or lubricants.

### ***What is the problem?***

All three alkyl phenols on the OSPAR list of chemicals for priority action are toxic to marine organisms and fulfil the OSPAR criteria for persistency and bioaccumulation. Nonylphenol, octylphenol and their derivatives (NP ethoxylates (NPE) and phenol/formaldehyde resins) are suspected endocrine disruptors which induce sex change in male fish. The main releases to the environment occur through discharge of waste water from land-based industrial activities where the substances are used as intermediates and from uses of derivatives in products.

### ***What has been done?***

Releases of alkyl phenols from industrial point sources are regulated in the EU framework. OSPAR Recommendation 92/8 and subsequent EU measures restrict the use of NP/NPEs in a number of products such as industrial and domestic cleaning, textiles and leather processing, metal working, manufacturing of pulp and paper, cosmetic products and pesticides. Measures to reduce production and use of NP/NPEs will also reduce releases of octylphenol compounds which may be present as impurities in NPEs. No specific measures exist for 2,4,6-TTBP which is considered to be used only in small quantities in Europe.

### ***Did it work?***

Quantitative data on emissions, discharges and losses of the three alkyl phenols to the environment are poor. The observed presence of alkyl phenols in waste water effluents, sewage sludge and rivers suggest that discharges of NP and OP continue from diffuse sources such as from the washing of imported textiles. Given their chemical properties, the main pathway is direct discharges and losses to water and sediments. It is expected that atmospheric concentrations are low and transport by air is unlikely. With existing measures it is expected that the cessation target will be met in 2020 for NP/NPE but not for octylphenol; available information is too limited to draw a firm conclusion for 2,4,6-TTBP.

### ***How does this affect the quality status?***

Limited monitoring data is available from which to draw conclusions on environmental status in relation to alkyl phenols. There is evidence that alkyl phenols can be present in all marine environmental compartments. For example, in the Greater North Sea, NP, OP and 2,4,6-TTBP have been detected in sediment samples from a highly industrialised UK estuary at levels of 5.88 mg/kg d.w., 0.53 mg/kg d.w. and 0.09 mg/kg d.w. Surveys carried out by Sweden in estuaries in the Kattegat region have detected levels of NP and OP in seawater exceeding EU environmental quality standards at reference and contaminated sites. In the Irish Sea, measurements of NP in water, mussels and sediment reach levels of up to 0.17 mg/kg d.w. in sediments. In Arctic Waters, the presence of NP and OP has been reported in sediments at reference sites (NP: up to 60 ng/kg d.w.; OP: up to <2.1 µg/kg d.w.). However, the measurements of alkyl phenols in the marine environment suggest that they may not pose a significant concern to the open sea, but may be of concern in areas close to sites of production or use.

*Electronic navigator to OSPAR publication sources (publication number):*

- ↳ Status and trend of marine chemical pollution (395/2009) – Annex 2 for monitoring data
- ↳ Towards the cessation target (354/2008)
- ↳ Background Documents (as updated) for
  - 2,4,6-tri-*tert*-butylphenol (274/2003)
  - nonylphenol/nonylphenol-ethoxylates (136/2001)
  - octylphenol (273/2003)