

Scouring detergent residues

Introduction

There has been a noticeable increase in interest in scouring detergent residues since 2003. This has been largely driven by initiatives arising from the updated European Commission Directive 76/769 concerning "certain dangerous substances and preparations", one of which is nonyl phenol ethoxylate (NPEO).

M38, 46 Nonyl phenol or nonyl phenol ethoxylates:

May not be placed on the market or used as a substance or constituent of preparations in concentrations equal or higher than 0,1 % by mass for the following purposes:

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(3) textiles and leather processing except:

- processing with no release into waste water,
- systems with special treatment where the process water is pre-treated to remove the organic fraction completely prior to biological waste water treatment (degreasing of sheepskin);

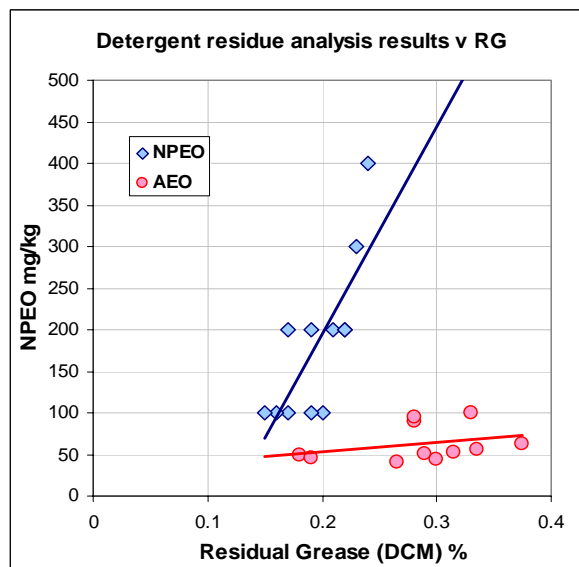
The primary concerns that prompted what is effectively a ban are aquatic toxicity and low biodegradability.

NPEO's are one class of non-ionic detergents in the alkyl phenol ethoxylates (APEO) group and constitute approximately 90% of the tonnage used commercially. NPEO's are not one chemical but a family of formulations. The environmental toxicity of other APEO's is similar to NPEO's. In Europe, approximately 8000 tonnes or 10% of total production was used in textile processing, mainly in wool scouring.

In addition to the EC Directive, in 1996-97, the British Association for Cleaning Specialities (BACS) and the Soap and Detergent Industry Association (SDIA) reached a voluntary agreement to remove all APEOs from industrial and institutional detergents by 1998. In 1996, Norway also decided to phase out use of all APEO's by 2000. In April 2004 the UK chemical supply industry and downstream users produced a Voluntary Agreement for risk reduction for nonylphenol, nonylphenol ethoxylates, octylphenol and octylphenol ethoxylates.

These Directives and Agreements are the most probable cause of the "APEO and NPEO-free" specifications now being seen.

In 1995, the four largest UK scouring companies used APEOs in the processing of 50% of all UK raw wool; by 1997, two had switched to alcohol ethoxylates, one had installed a novel treatment process and the other had ceased trading.



Alternative detergents

Alcohol ethoxylates (AEO's) are regarded as the primary substitute for NP's, but this also represents a wide group of chemical formulations. In general terms these chemicals biodegrade faster and with less harmful products than NPEO's.

In terms of direct toxicity of NPEOs as compared with the main suggested alternatives (alcohol ethoxylates), there is considerable variability both *between* the two classes and *within* the classes themselves. A linear alcohol ethoxylate with parent alcohol chain length C and 2-10 ethoxylate groups has been shown to have acute toxic effects in some 12-15 species at below 1 mg/l whereas a branched C compound with 8 ethoxylate groups (octyl ethoxylate), only 10 exerts such effects at above 100 mg/l. The toxicity issues are therefore not at all clear-cut.

Additionally, most of the alternatives have been said to be more expensive and less efficient in wool scouring and produce higher levels of normal residuals, although IWS produced data in the 1990's to suggest that these problems could be overcome with specific formulations.

Detergent residue analysis

Detergent residues seem to be associated with the residual grease left on the fibre after scouring (see plot). A limited amount of data suggests that under normal NZ scouring regimes, the residual detergent levels are nevertheless well below 0.1%. (0.1% is equivalent to 1000 mg/kg – off the scale in the plot above).

The data available to date also indicates that switching to AEO detergents for specific consignments may not necessarily produce zero NPEO residues. This may be because of the difficulty of completely flushing out NPEO from the scour before changing detergent.