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AGRO CHEMICALS

Replacement for NPEO based additives

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Introduction

Nonylphenol and nonylphenol ethoxylates are known to have a high environmental risk and are harmful to humans and bio organisms. In Europe the use of NP based products is strictly regulated since 2003. During the last years more and more countries addressed this issue. Reduction and complete prohibition of NP based products has become a fact in almost all applications. Nonylphenol ethoxylates are widely used in agrochemical, coating, metal working and various other industrial formulations. Depending on the ethoxylation grade the products are used as emulsifiers, wetting agents or dispersants. It is hard to find a single compound class that will act as replacement for NPEO's and which can cover this broad application scope.

Below we indicate suitable alternatives with respect to the application profile.

Applications NPEO surfactants

(source EPA 2010)

- Detergents & cleaners
- Degreasers & dry cleaning aids
- Petroleum dispersants
- Emulsifiers & wetting agents
- Adhesives
- Indoor pesticides
- Cosmetics
- Paper and textile processing formulations
- Prewash spotters
- Metalworking fluids & oilfield chemicals
- Paints and coatings
- Dust control agents
- Phosphate antioxidants for rubber and plastics
- Miscellaneous uses, including lube oil additives

NPEO as emulsifier

The choice of emulsifier is closely related to the HLB value of the systems in the final formulation. This relationship allows the proper selection of alternatives to NPEO's. For emulsifying, LEVACO recommends the following alternatives (table 1).

HLB	6 – 7	10 – 12	12 – 13	12 – 13	14	15 – 16	16	17 – 18
NPEO	NPE 2	NPE 4	NPE 6	NPE 7	NPE 10	NPE 15	NPE 20	NPE 30
Alternative LUCRAMUL	L 03	L 05	L 06	L 06	2310	L 10	1819 DB	L 30
Alternative LUCRAMUL	-	2304	C 10/6	C 10/6	-	1819 DB	-	-

Table 1: Alternatives for NPEO emulsifiers

NPEO as wetting agent

As wetting agent a surfactant must be in the position to modify, this means in most cases, to reduce the surface tension of the system. The main selection criteria for replacement is the surface tension behavior, (static as well as dynamic surface tension) which must be in line with the NPEO product to be replaced (table 2).

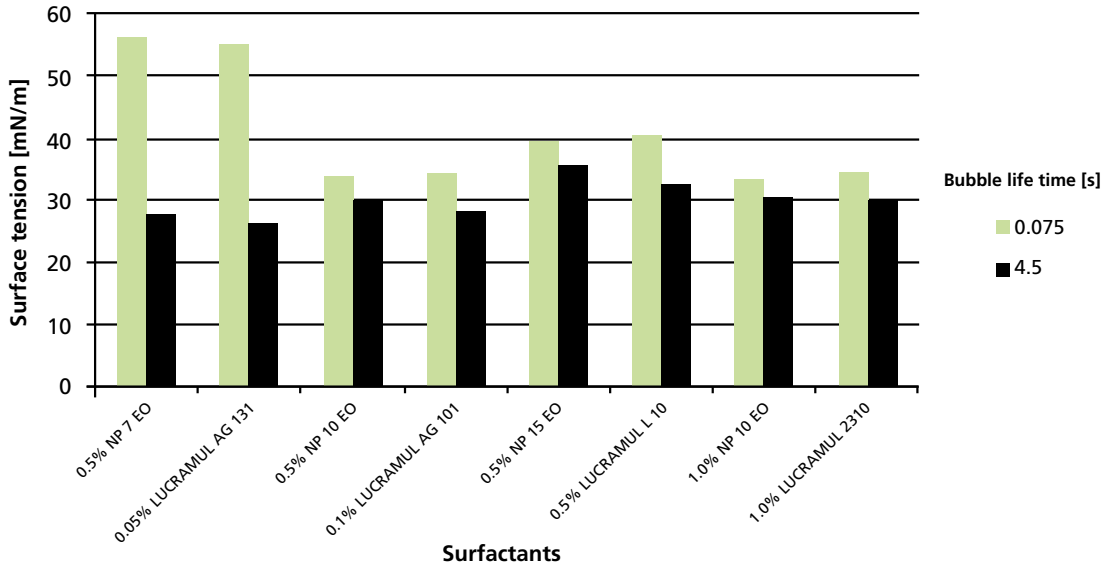

Table 2: Surface tension of surfactant solutions at different interface age

Surface tension values vary substantially at different concentrations of surfactant. At a defined concentration NPEO could be replaced by the alternatives in table 3.

NPEO	Alternative
0.5% NPEO with 7 EO	0.05% LUCRAMUL AG 131
0.5% NPEO with 15 EO	0.5% LUCRAMUL L 10
1.0% NPEO with 10 EO	1.0% LUCRAMUL 2310

Table 3: Alternatives for NPEO wetting agents

NPEO as dispersing agent

NPEO has a compact structure containing alkyl chain, aromatic group and polyether. As dispersing agent for active ingredients in water, the alkyl chain and aromatic ring are anchoring groups, while the polyether has the function of a hydrophilic tail. Simple alkyl ethoxylates, which are useful as replacements in emulsions and as wetting agents, usually fail as dispersing agents. But products like LUCRAMUL PS types, as well as LUCRAMUL PMS 16 and LUCRAMUL PMS 54 60 provide a strong interaction with solid particle surfaces and have a comparable solubility. They are therefore suitable replacements for NPEO's in dispersions. For phosphate ester and sulfate ester of NPEO we can offer LUCRAMUL PPS types and LUCRAMUL SPS types as alternatives.

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