



## BIODEGRADATION OF ALCOHOL ETHOXYLATES

### Applicable to these current Stepan products:

BIO-SOFT® 35-7	BIO-SOFT® AE-3	BIO-SOFT® E-670
BIO-SOFT® E-678	BIO-SOFT® E-840	BIO-SOFT® E-847
BIO-SOFT® EA-8	BIO-SOFT® EC-600	BIO-SOFT® EC-639
BIO-SOFT® EC-690	BIO-SOFT® EN-695	BIO-SOFT® EN8-90
BIO-SOFT® ET-650	BIO-SOFT® FF-400	BIO-SOFT® GSB-9
BIO-SOFT® N-1200	BIO-SOFT® N-400	BIO-SOFT® N-600
BIO-SOFT® N-900	BIO-SOFT® N-901	BIO-SOFT® N-905
BIO-SOFT® N1-3	BIO-SOFT® N1-5	BIO-SOFT® N1-7
BIO-SOFT® N1-73B	BIO-SOFT® N1-9	BIO-SOFT® N23-3
BIO-SOFT® N23-5	BIO-SOFT® N23-6.5	BIO-SOFT® N25-12
BIO-SOFT® N25-3	BIO-SOFT® N25-7	BIO-SOFT® N25-9
BIO-SOFT® N45-7	BIO-SOFT® N91-2.5	BIO-SOFT® N91-6
BIO-SOFT® N91-8	BIO-SOFT® TD-630	MAKON® DA-6
MAKON® TD-12	MAKON® TD-3	MAKON® TD-6
MAKON® TD-8	MAKON® TD-9	p4mX® 1-5
p4mX® 1-7	p4mX® 25-7	p4mX® 25-79
p4mX® 400	p4mX® 900	p4mX® 91-6
p4mX® 91-8	POLYSTEP® TD-129	POLYSTEP® TD-189
POLYSTEP® TD-3	POLYSTEP® TD-6	STEPANTEX® TD-560
STEPANTEX® TD-630	p4mX® 1-9	p4mX® 23-6.5
p4mX® 24-23	p4mX® 24-24	p4mX® 24-5
		p4mX® 24-7
		p4mX® 24-9
		p4mX® 25-9
		p4mX® 91-2.5
		p4mX® 25-3

### Applicable to these inactive Stepan products:

BIO-SOFT® AE-1	BIO-SOFT® AE-2	BIO-SOFT® EA-10
MAKON® TD-18	POLYSTEP® AE-120	POLYSTEP® F-13
STEPANTEX® TD-560	MAKON® TD-6-85	BIO-SOFT® EA-4
MAKON® TD-15	POLYSTEP® F-12	

### Biodegradation Information:

Alcohol ethoxylates (AE) are presently the largest volume nonionic surfactants produced in the U.S., with linear AE as the predominant type.

Variability in the alkyl chain length does not appear to greatly affect the rate and the extent of linear AE biodegradation. However, the degree of branching of the alkyl chain may affect the rate of biodegradation. As a class, alcohol ethoxylates undergo rapid primary (97% in 5-7 days) and ultimate ( $\geq 65\%$  in 28 days) biodegradation under OECD 301 B, D, & F test guidelines.

Although biodegradation of AE surfactants has been assumed to be slower under anaerobic as compared to aerobic conditions, a number of studies has confirmed  $> 80\%$  biodegradation by anaerobic bacteria. Anaerobic biodegradation tests have been performed using both anaerobically digested sludge and anaerobic sediment as inocula.

The available treatment plant data indicate extensive removal ( $>80\%$ ) of AE through both degradation and adsorption to sludge as determined by Cobalt Thiocyanate Active Substances (CTAS) method, Bismuth Iodide Active Substance (BIAS) method, Thin Layer Chromatography (TLC), or Biochemical Oxygen Demand Method (BOD). Field tests performed at sights other than treatment plants (e.g. pond water) show AE removal as being greater than 90% as measured by the CTAS method.

The listed products comply with the EU Detergent Regulation (EC) No. 648/2004.

## References:

\*Human & Environmental Risk Assessment (HERA) on ingredients of European household cleaning products- Alcohol Ethoxylates (2009).

\*Swisher, R.D., "Surfactant Biodegradation", Vol. 18, 2nd Edition, Marcel Dekker, Inc., 1987, pp. 482-484, 846-847.

\*Talmage, S.S., "Environmental and Human Safety of Major Surfactants, Part I: Alkylphenol Ethoxylates", Lewis Publishers, pp. 35-50.

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