



BIODEGRADATION OF ALKYLPHENOL ETHOXYLATES

Applicable to these current Stepan products:

MAKON® 10	MAKON® 12	MAKON® 14
MAKON® 20	MAKON® 30	MAKON® 4
MAKON® 50	MAKON® 6	MAKON® 8
MAKON® OP-9	POLYSTEP® F-1	POLYSTEP® F-10
POLYSTEP® F-2	POLYSTEP® F-3	POLYSTEP® F-4
POLYSTEP® F-5	POLYSTEP® F-6	POLYSTEP® F-9
POLYSTEP® F-95B	POLYSTEP® OP-3070	POLYSTEP® OP-9
NEUTRONYX® 656	MAKON® 5	MAKON® 7.5
MAKON® 34	MAKON® 40	MAKON® NP-4070
MAKON® 5570	MAKON® NP-7070	MAKON® NPE 4.5
MAKON® OP-30-7	POLYSTEP® F-5050	

Applicable to these inactive Stepan products:

MAKON® OP-40-7	POLYSTEP® OP-4070	
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Biodegradation Information:

Alkylphenol ethoxylates (APE) compose one of the major classes of nonionic surfactants. In 1988, approximately 450 million pounds of APE surfactants were sold in the United States. As a result of their widespread use, the biodegradation or removal of alkylphenol ethoxylate surfactants has been extensively studied.

Primary and ultimate biodegradation of APE surfactants have been observed in a variety of laboratory test systems. In general, both primary and ultimate biodegradation rates decreased with increasing EO chain length. Primary biodegradation, under laboratory conditions, typically exceeds 90% within 28 days. Ultimate biodegradation, as measured by Chemical Oxygen Demand (COD) or Dissolved Organic Carbon (DOC) has been observed to reach 89% in 7 days. Ultimate biodegradation of APE surfactants under anaerobic conditions does occur but at a significantly slower rate.

Field studies indicate that APE surfactants undergo primary and ultimate degradation at wastewater treatment plants where removal rates could exceed 95%. The reported concentrations of APE in wastewater sludge from different sources within the U.S. range from 3.9 to 120 mg/kg dry weight. Aerobic biodegradation in the soil can reach over 80% within a month.

References:

*Swisher, R.D., "Surfactant Biodegradation", Vol. 18, 2nd Edition, Marcel Dekker, Inc., 1987, pp. 851-860.

*Talmage, S.S., "Environmental and Human Safety of Major Surfactants - Alkylphenol Ethoxylates", Soap and Detergent Association, 1994, pp. 235-253.

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Last Update: 01/20/99

Revision reference: BI010.02

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