

# INDUSTRIAL APPLICATIONS OF SURFACTANTS - NORTH AMERICAN FORECAST TO 2010

Eight key industrial applications in the U.S. and Canada will consume over 1.6 billion lbs of surfactants in 2000. These applications include Agricultural Chemicals, Paint, Paper, Plastics & Elastomers, Textiles, and three construction-related applications -- Asphalt, Cement and Wallboard.

Collectively these eight end uses account for over 90 percent of the industrial market for linear alkylbenzene sulfonates, alcohol ethoxylates, alkylphenol ethoxylates and naphthalene sulfonate formaldehyde condensates, as well as many smaller volume and/or specialty surfactants such as alcohol ethoxysulfates, sulfosuccinates, phosphate esters, ethoxylated amines and quaternaries.

Colin A. Houston & Associates has completed a new multiclient study of these industrial applications of surfactants in North America, as outlined in the following pages. The study quantifies the consumption of over 40 different types of surfactants in 50 subsegments within eight important end uses, using 1998 as the base year. It also provides end use production data and discusses market trends, analyzes end use and surfactant technology, and reports on surfactant customer preferences and practices. The study forecasts surfactant use by subsegment and by surfactant for 2000, 2005 and 2010, and includes historical 1995 data to enhance perspective.

This comprehensive new 430-page study is available for immediate delivery. The following pages contain the table of contents and other details. Please contact us at the address at the end of this prospectus.

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## DESCRIPTION OF THE STUDY

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Surfactant consumption in the eight industrial applications covered in this study is expected to grow at a fairly modest average annual rate of 2.4 percent, from 1.5 billion lbs in 1998 to over 2.0 billion lbs in 2010. However, growth rates for individual surfactants in specific segments range from negative, e.g., APE use in Paper, to as high as 8.7 percent/year. Environmental concerns and new technology are creating new opportunities for alert suppliers to improve their position through technical and/or marketing expertise. CAHA's new study analyzes all the factors affecting surfactant use in each application, and provides the data and insights needed for suppliers to take advantage of these emerging opportunities.

The accelerating pace of mergers, acquisitions and cooperative agreements is another key trend affecting the market for industrial surfactants. Alliances between major players in Ag Chem, Paint, Paper and other applications are realigning the surfactant customer base, while consolidation and repositioning among surfactant producers has been changing the supply structure. The study analyzes this new competitive environment and its implications for surfactant suppliers.

*Industrial Applications of Surfactants - North American Forecast to 2010* is CAHA's sixth comprehensive multiclient study of industrial surfactants in North America. It is designed to provide specific market intelligence to support surfactant sales and planning. The following is a brief overview of the contents by chapter.

### ENVIRONMENTAL ISSUES

Environmental Issues concerning each of the industrial end uses as well as the surfactants used in them are detailed. Evolving concerns related to biodegradability, toxicity, and endocrine disruption are addressed. Also included are discussions of European developments and their potential influence on North American markets.

### LEADING ORGANIC SURFACTANTS

This chapter provides a summary of industrial surfactant consumption and an analysis of the surfactant market structure. It details individual surfactant suppliers, including their integration and surfactant product offerings, and lists the locations, capacities, processes and major products for each ethoxylation and sulfation/sulfonation plant in the U.S. and Canada. It also provides in-depth reviews of ten leading commodity and specialty surfactants, including technology and producers, utilization, and consumption by end use.

## AGRICULTURAL CHEMICALS

The ag chem market is undergoing unprecedented change due to a number of developments. Genetically modified (GM) crops that resist certain pests or that are designed to be used with specific pesticides have had a major impact on the crop protection market and related surfactant use. However, the consumer backlash against GM foods has undermined the rapid growth earlier expected for GM crops. The patent on one of the most widely used herbicides, Monsanto's Round-up<sup>®</sup>, is expiring in 2000, and other companies will be supplying glyphosate herbicides. The changing prospects for different categories of GM crops and for certain pesticides are major contributors to the ongoing consolidation among pesticide producers. CAHA's new study analyzes all of these complex factors and presents a carefully considered forecast for surfactant consumption in the various types of pesticides and in adjuvants.

## ASPHALT

The North American market for asphalt has had good growth in recent years due to the strong U.S. economy and increased local, state and federal government spending on road building and repairs. At the high end, a niche market is developing for polymer-modified asphalt, which provides superior performance for racetrack paving and other specialty uses by incorporating scrap plastic such as LLDPE. Asphalt is an important market for fatty amines and tall oil derivatives, and the study identifies trends that affect their use.

## CEMENT

Consumption of cement grew 6.3 percent/year between 1995 and 1998, and the outlook is positive as new construction of both single and multi-family homes, office buildings, and retail and other buildings continues at above-average rates before slowing with the overall economy. Surfactants used in the production of concrete are primarily lignosulfonates, but naphthalene sulfonate formaldehyde condensates dominate the superplasticizer segment. Several other surfactants are also used. The study discusses trends in surfactant use and quantifies consumption by type, including the newer polycarboxylates, which are growing in popularity.

## PAINT

North American paint manufacturers have had a major issue to deal with — the impact of new regulations regarding the level of volatile organic compounds (VOC) and hazardous air pollutants (HAP) in their products. Paints with lower VOC levels typically contain higher levels of surfactants. In addition to the ongoing gradual shift from solvent-based to water-based paints, newer technologies, such as radiation-cured coatings, are growing at rates of 5 to 15 percent per year. The study discusses trends in paint types and formulations, and identifies which surfactants will benefit most from regulatory and other developments affecting the paint market.

## PAPER

U.S. pulp and paper manufacturing is among the industries that has had no choice but to radically address environmental issues. Producers are currently implementing the EPA-mandated switch to elemental chlorine free bleaching that must be completed by 2001. They are also working to modify existing processes and develop new processing methods to achieve more efficient and more environmentally friendly manufacturing. These efforts are impacting surfactant consumption. CAHA's new study identifies trends in surfactant use in the various processes involved in paper manufacture. It also reports on the status of recycling and the changing use of surfactants in deinking.

## PLASTICS AND ELASTOMERS

Over 360 million lbs of surfactants will be used in 2000 in the emulsion polymerization of nine major plastics and elastomers. Growth rates vary, with polyvinyl chloride (PVC) and vinyl acetates (PvaC) in the lead. Surfactant suppliers profit from good growth and increased sales, but individual success in this market has more to do with technical proficiency and the ability to cultivate close relationships with customers. There is a continuing trend to reduce the level of surfactant used and customers may consider using a different surfactant if it can be demonstrated to be higher performing. This could represent an opportunity for new suppliers, and several surfactant suppliers are currently seeking to expand their position in this potentially very profitable market. The new study discusses the utilization of individual surfactants and their prospects, as well as detailing market trends and forecasting surfactant consumption in each segment of the market.

## TEXTILES

The North American textile industry, like many others, is going through a period of consolidation, most notably among suppliers of formulated textile chemicals. The smaller suppliers of textile chemicals including surfactants, are finding it harder and harder to compete with the larger formulators, who offer a broad range of products. The new study analyzes this trend in addition to reporting on the various segments of the textile surfactant market. It quantifies and forecasts consumption of 28 individual surfactants in 17 different segments.

## WALLBOARD

The production and use of wallboard is tied to the fortunes of the construction industry, which is currently enjoying strong growth in the United States. Wallboard is an important market for naphthalene sulfonate formaldehyde condensates, and is a small but growing market for alcohol ether sulfates. CAHA's new study quantifies and forecasts the use of these and other surfactants, and identifies the key surfactant suppliers and customers.

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## SAMPLE TABLES

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NORTH AMERICA - SURFACTANT CONSUMPTION IN INDUSTRIAL APPLICATIONS, 1995-2010 (million lbs)						
	1995	1998	2000	2005	2010	AAGR % 1998-2010
Agricultural chemicals						
Asphalt						
Cement						
Paint						
Paper						
Plastics and elastomers						
Textiles						
Wallboard						
TOTAL						

Table III-14						
CANADA - ALCOHOL ETHOXYLATE CONSUMPTION IN INDUSTRIAL APPLICATIONS, 1995-2010 (million lbs)						
	1995	1998	2000	2005	2010	AAGR% 1998-2010
Agricultural chemicals						
Paper						
Textiles						
TOTAL						

Table III-25						
U.S. - NAPHTHALENE SULFONATE FORMALDEHYDE CONDENSATE CONSUMPTION IN INDUSTRIAL APPLICATIONS, 1995-2010 (million lbs)						
	1995	1998	2000	2005	2010	AAGR% 1998-2010
Agricultural chemicals						
Cement						
Paint						
Paper						
Plastics and elastomers						
Textiles						
Wallboard						
TOTAL						

Table III-37						
CANADA - EO/PO COPOLYMER CONSUMPTION IN INDUSTRIAL APPLICATIONS, 1995-2010 (million lbs)						
	1995	1998	2000	2005	2010	AAGR % 1998-2010
Agricultural chemicals						
Paper						
Textiles						
TOTAL						

Table IV-6						
U.S. - SURFACTANT CONSUMPTION BY AGRICULTURAL PRODUCT TYPE, 1995-2010 (million lbs)						
	1995	1998	2000	2005	2010	AAGR% 1998-2010
Emulsifiable concentrates <sup>a</sup>						
Suspension concentrates						
Aqueous solutions						
Wettable powders						
Dry flowables						
Concentrated emulsions						
Subtotal						
Adjuvants						
TOTAL						
<sup>a</sup> Includes estimates for overall surfactant consumption in microemulsions						

Table IV-9						
U.S. - SURFACTANT CONSUMPTION IN AQUEOUS SOLUTIONS, 1995-2010 (million lbs)						
	1995	1998	2000	2005	2010	AAGR% 1998-2010
Nonylphenol ethoxylates						
Octylphenol ethoxylates						
Ethoxylated tallow amines						
Phosphate esters						
Others <sup>a</sup>						
TOTAL						
<sup>a</sup> Includes ethoxylated alcohols, acids, and sorbitan esters.						

Table VI-3

NORTH AMERICA - SURFACTANT CONSUMPTION IN CEMENT, 1995-2010  
(million lbs)

	1995	1998	2000	2005	2010	AAGR % 1998-2010
<b>UNITED STATES</b>						
Lignosulfonates						
Naphthalene sulfonate formaldehyde condensate						
Sulfonated melamine formaldehyde condensate						
Tall Oil Types						
Polycarboxylates						
Others						
TOTAL U.S.						
<b>CANADA</b>						
Lignosulfonates						
Naphthalene sulfonate formaldehyde condensate						
Sulfonated melamine formaldehyde condensate						
Tall Oil Types						
Polycarboxylates						
Others						
TOTAL CANADA						
TOTAL NORTH AMERICA						
n = negligible						

Table VII-4						
U.S. - PAINT PRODUCTION BY END USE, 1995-2010 (million gallons)						
	1995	1998	2000	2005	2010	AAGR % 1998-2010
Architectural						
Industrial OEM Special-purpose						
Subtotal						
TOTAL						

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U.S. - SURFACTANT CONSUMPTION IN HIGH SOLIDS PAINTS, 1995-2010 (million lbs)						
	1995	1998	2000	2005	2010	AAGR% 1998-2010
Alkylphenol ethoxylates <sup>a</sup>						
Alkyl naphthalene sulfonates						
Naphthalene sulfonate formaldehyde condensates						
Soap						
Silicones						
Phosphate esters						
Other anionics <sup>b</sup>						
Others nonionics <sup>c</sup>						
TOTAL						
<sup>a</sup> Nonylphenol and octylphenol ethoxylates. <sup>b</sup> Including sulfosuccinates, alkylaryl sulfates and alkylbenzene sulfonates. <sup>c</sup> Including alcohol ethoxylates, ethoxylated castor oil.						

Table VIII-20

NORTH AMERICA - CONSUMPTION OF SURFACTANTS IN  
PULP AND PAPERMAKING, 1995-2010  
(million lbs)

	1995	1998	2000	2005	2010	AAGR% 1998-2010
<b>UNITED STATES</b>						
In defoamers <sup>a</sup>						
Alkylphenol ethoxylates						
Alcohol ethoxylates						
Naphthalene sulfonate formaldehyde condensates						
Unspecified ethoxylates						
EO/PO block polymers						
Fatty acids						
Others						
TOTAL U.S.						
<b>CANADA</b>						
In defoamers <sup>a</sup>						
Alkylphenol ethoxylates						
Alcohol ethoxylates						
Naphthalene sulfonate formaldehyde condensates						
Unspecified ethoxylates						
EO/PO block polymers						
Fatty acids						
Others						
TOTAL CANADA						
GRAND TOTAL NORTH AMERICA						
<sup>a</sup> Includes fatty alcohols, fatty acid esters, silicones, PEG, phosphate esters, EO/PO copolymers, ethoxylates and others.						

Table IX-6						
U.S. - PRODUCTION OF CARBOXYLATED STYRENE LATEXES AND RELATED SURFACTANT CONSUMPTION, 1995-2010 (million lbs)						
	1995	1998	2000	2005	2010	AAGR % 1998-2010
Carboxylated SB latex <sup>a</sup>						
SURFACTANTS						
Linear alkylbenzene sulfonates						
Alkylphenol ethoxylates						
Alcohol sulfates						
Sulfosuccinates						
Alkylphenol ethoxysulfates						
Diphenyl ether disulfonates						
Others						
TOTAL						
<sup>a</sup> Includes high-styrene latex.						

Table X-10						
CANADA - SURFACTANT CONSUMPTION IN COTTON ALKALINE BOIL, 1995-2010 (million lbs)						
	1995	1998	2000	2005	2010	AAGR % 1998-2010
Alcohol ethoxylates						
Alkylphenol ethoxylates						
Sulfated oils						
TOTAL						

Table X-36						
U.S. - TOTAL SURFACTANT CONSUMPTION IN TEXTILE FINISHING BY PROCESS, 1995-2010 (million lbs)						
	1995	1998	2000	2005	2010	AAGR % 1998-2010
Fabric softening processes						
Textile dyeing and printing						
Flame resistant fabric production						
Foam finishing						
Anti-soil treatments						
TOTAL						

Table X-43						
CANADA - SURFACTANT CONSUMPTION IN TEXTILE DYEING AND PRINTING, 1995-2010 (million lbs)						
	1995	1998	2000	2005	2010	AAGR % 1998-2010
Alcohol ethoxylates						
Alkyl naphthalene sulfonates						
Alkylphenol ethoxylates						
Ethoxylated amines						
Naphthalene sulfonate formaldehyde condensates						
Phosphate ester ethoxylates						
EO/PO copolymers						
Quaternaries						
Lignosulfonates						
Sulfated oils						
Sulfosuccinates						
TOTAL						

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## QUALIFICATIONS AND PERSONNEL

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Colin A. Houston & Associates Inc. was founded in 1971 to provide consulting services to the chemical industry worldwide. The primary area of expertise was and continues to be surfactants: raw materials, intermediates, major surfactants, and the surfactant-consuming industries. Other areas of activity include: a variety of industry studies on such topics as detergent builders, ingredients for personal care products, and bleaching agents; engineering studies such as a worldwide study of glycerine evaporation plants with recommendations for improved efficiency; a world study of the state of the art in spray-drying detergents; contracts with the U.S. Government to develop industry effluent guidelines; and business strategy and acquisition studies.

The reputation thus earned by CAHA for comprehensive, high quality techno-economic and market analyses has led to a variety of engineering, marketing, and strategic planning studies for individual clients in North America, Western Europe, and the Far East.

The project team approach utilized by CAHA includes a core of senior and technical professionals augmented by expert consultant associates. The following brief synopses present the staff and consultants who carried out the study, INDUSTRIAL APPLICATIONS OF SURFACTANTS - NORTH AMERICAN FORECAST TO 2010.

***Marilyn L. Bradshaw, Vice President,***

was the project leader for INDUSTRIAL APPLICATIONS OF SURFACTANTS - NORTH AMERICAN FORECAST TO 2010, POLYOLEFIN COMONOMERS - WORLD MARKETS, 1995-2005 and ALPHA-OLEFINS - WORLD MARKETS, 1990-2002. Other recent multiclient studies she has directed include THE U.S. METALWORKING INDUSTRY AND SURFACTANT CONSUMPTION, 1995-2005, U.S. I&I CLEANING PRODUCTS - SURFACTANT SUPPLIERS AND CUSTOMERS, and MAJOR INDUSTRIAL APPLICATIONS OF SURFACTANTS - NORTH AMERICAN FORECAST TO 2005. She is the editor of CAHA's monthly alpha-olefin newsletter and provides consultation to clients on alpha-olefins. Since joining CAHA in 1980, she has also been the project leader for numerous proprietary projects such as an analysis of the growth prospects for 22 U.S. surfactant ethoxylators. Ms. Bradshaw has a B.A. from Finch College and an economics and management certificate from Manhattanville College. She is an active member of CDMA.

***Dr. Darrel L. Muck, Senior Research Associate,***

authored our multiclient studies GLUCOSAMIDES: THE CHALLENGE OF A NEW SUGAR-BASED SURFACTANT, 1993-1998 and DEVELOPMENTS IN

DETERGENT BUILDER SYSTEMS - NORTH AMERICAN REPORT TO 2005. He has also contributed sections of CAHA's study INDUSTRIAL APPLICATIONS OF SURFACTANTS - NORTH AMERICAN FORECAST TO 2010, SURFACTANTS FOR EMERGING MARKETS IN ASIA/PACIFIC, 1995-2010, SURFACTANTS FOR CONSUMER PRODUCTS - NORTH AMERICAN FORECAST TO 2008, OPPORTUNITIES IN PERFORMANCE SURFACTANTS IN THE U.S. and was responsible for the Paint end use chapter of MAJOR INDUSTRIAL APPLICATIONS OF SURFACTANTS - NORTH AMERICAN FORECAST TO 2005. Dr. Muck has 30 years experience in the chemical industry and was most recently Director of Commercial Development, FMC Chemicals Division. He holds B.S./M.S. degrees in chemistry from Wichita State University and a Ph.D. in Organic Chemistry from the University of Florida. He is a member of ACS and AOCS.

***H. James Bigalow, Senior Research Associate,***

authored the Paper and Textiles end use sections of our multiclient studies INDUSTRIAL APPLICATIONS OF SURFACTANTS - NORTH AMERICAN FORECAST TO 2010 and SURFACTANTS FOR EMERGING MARKETS IN ASIA/PACIFIC, 1995-2010, contributed to SURFACTANTS FOR CONSUMER PRODUCTS - NORTH AMERICAN FORECAST TO 2008 and has worked on proprietary detergent and surfactant studies. Mr. Bigalow has over 20 years experience as a senior marketing research executive in the chemical industry. He has conducted successful business analysis projects which have included financial evaluations of businesses and acquisition candidates, identifying current and future markets for new and existing products, and product development and usage. Additional experience has included economic and sales forecasting, strategic planning, proprietary market research projects, benchmarking, and product safety. He is a member of the CDMA, the Society of Competitive Intelligence Professionals (SCIP), ACS and the Chemical Marketing and Economics Division of the ACS. Mr. Bigalow holds an M.S. Industrial Administration, Krannert School of Management, Purdue University and a B.S. degree in Chemistry, Denison University.

***Alan L. Peterkofsky, Senior Consultant Associate***

authored the Plastics and Elastomers chapter of INDUSTRIAL APPLICATIONS OF SURFACTANTS - NORTH AMERICAN FORECAST TO 2010. Mr. Peterkofsky has over 30 years experience in the chemical industry, and was most recently business director, emulsion polymerization for Rhône-Poulenc Surfactants and Specialties (now Rhodia). Prior to joining Rhône-Poulenc, he was commercial development manager, W.R. Grace & Co, Research Division. Mr. Peterkofsky was also involved in tech service and product management for surfactants and specialty monomers for Alcolac, Inc., after beginning his career as an applications chemist at Celanese working on specialty chemicals research and product development for emulsion polymerization. He holds B.S. and M.S. degrees in Chemistry from Long Island University, and an MBA from The John Hopkins University. He is a member of ACS and CDMA.

***Jenny Qin Li, Research Associate***

authored the Ag Chem and other sections of our multicient studies INDUSTRIAL APPLICATIONS OF SURFACTANTS - NORTH AMERICAN FORECAST TO 2010 and SURFACTANTS FOR EMERGING MARKETS IN ASIA/PACIFIC, 1995-2010, the Personal Care section of SURFACTANTS FOR CONSUMER PRODUCTS - NORTH AMERICAN FORECAST TO 2008 and the Betaines, Sarcosinates and Amine Oxide sections of OPPORTUNITIES IN PERFORMANCE SURFACTANTS IN THE U.S. She holds a B.S., Industrial Foreign Trade and Computer Science, Shanghai University of Technology, Shanghai, China and has a Masters degree in Business Administration, Clark University, Worcester, MA.

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## HOW TO SUBSCRIBE

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