

Colin A. Houston and Associates, Inc.
announces a new study entitled

HIGHER ALCOHOLS - FORECAST TO 2020

Nearly a million tons of new oleo alcohols capacity is due on stream in the next 15 months. This poses an unprecedented challenge for the 1.7 million ton higher alcohols market. According to a new study by Colin A. Houston & Associates, Inc. (CAHA), oleo-based alcohols accounted for 61 percent of the market in 2005 and will increase to over 65 percent in 2010. The new oleo capacity will affect not only petroleum and coal-based alcohols, but will challenge existing oleo producers as well. Three surfactants account for over two-thirds of alcohol demand, but a range of other surfactant materials will be affected by the surge in supply. Most notably, the new level of competition will also impact the 2.6 million ton linear alkylbenzene market. Demand for higher alcohols is forecast to grow at 3.8 percent per year to 2020, but additional growth may be achieved through substitution activity by end customers. CAHA's new study includes alternative demand scenarios to provide insight and help identify the potential strategies for this oleo - petro competition over the next decade.

The 400 page survey, completed in July 2006, is available in hard copy or in electronic form over the internet.

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DESCRIPTION OF THE STUDY

_____ *Higher Alcohols - Forecast to 2020* explores the issues for this key surfactant intermediate. It compares the status of oleo alcohols of the past and examines the role of coexistence with petro-based alcohols that are threatened by nearly 1 million tons/year of new oleo capacity.

If the composition of the higher alcohol market is to fundamentally change, there are a series of issues for producers and customers to explore. Much of the market is captive. The number of large buyers is limited. There are strong roles played by up and downstream integration. The outlook for the companies that convert merchant alcohols to derivatives is always pressured by integrated competitors. Oleo producers are affected by the declining role of glycerine.

The following discussions review the objectives of the different chapters.

I. Raw Materials

The changing outlook of feedstocks is driving a realignment of the industry. Lingering issues remain and are reviewed. The build-up of the fatty acid industry in China and Southeast Asia has been based on the deep resources of palm oil. The lauric oils, coconut and palm kernel, on which fatty alcohols rely, are not in the same kind of situation. Weather factors can have a profound impact on availability. The potential for oleo plants to fall short of adequate lauric feedstocks cannot be overlooked. This chapter reviews the key issues and characteristics of the oils and fats used as higher alcohol feedstocks.

The news that crude oil production is expected to peak in the next two years also has far ranging implications. The linkage between crude oil and natural gas prices has an important impact on ethylene economics. The traditional view that U.S. Gulf coast economics are superior to those of other regions no longer prevails and this change will affect the relationships of derivatives around the world. The competition from Middle Eastern ethylene could eventually cap ethylene capacity increases in competing regions and force petro-based alcohols to compete against other outlets for existing supplies. Issues such as supply and market characteristics for ethylene and n-paraffins are discussed in this section.

II. Higher Alcohols Technology

_____ Alcohols plants produce a range of products and future producers must choose the right mix to gain success. This chapter evaluates the different process routes and their economics. Another key aspect is the co-product situation. As the biodiesel

industry has rapidly emerged, glycerine values have declined. Other co-products and cuts of alcohols may not be reliable profit centers for the producers of tomorrow. When oleo co-product economics suffer, their ability to compete for the mid-cut market also diminishes.

III. Higher Alcohols Supply

_____ Capacity and production of detergent alcohols are evaluated by type, region and producer. Forecast volumes are developed for base demand levels provided in the alcohols demand chapter. Producers are profiled with plant descriptions that include products, processes employed and integration factors. This chapter also includes the captive and merchant alcohols analysis.

IV. Higher Alcohols Demand

_____ The report includes an end market analysis in Chapter VI. This data provides a baseline demand for alcohol applications. In the Demand Chapter, the derivative volumes are translated back to alcohol demand based on the end market analysis. In order to explore the impact of new oleo supplies, two additional demand scenarios are provided. The impact from competing feedstocks and competing surfactants is analyzed. This chapter explores chain length issues; the impact of captive vs. merchant market alignments; integration factors — up and downstream — since large volumes are sold as derivatives; the impact of on-going consolidation; and market access implications for oleos.

V. Higher Alcohol End Uses

_____ The end uses of detergent alcohols, derivatives and direct applications, are reviewed and quantified. This chapter provides analysis of:

- Technology: process routes, product variations, performance issues
- Applications: oleo and petro preferences, competing surfactant product issues
- Markets: consumption by application area and region, major customers, integration issues.

VI. Surfactant End Markets

The global surfactant market is reviewed and forecast by region in terms of household, personal care and industrial demand. These key areas where alcohol derivatives are used have many dynamics affecting them. Issues and sensitivities of competing surfactants are explored. Environmental issues have had a significant impact on surfactant use over the years and further development in this area can be expected. Environmentally related topics are discussed where relevant in this chapter.

For instance: APE regulations; LABS and anaerobic biodegradability — real or imagined issue; the Detergents Directive, the ultimate biodegradability standard, REACH and implications for other regions.

CAHA has a unique perspective on the higher alcohols business, after 30 years of experience in providing multiclient studies and proprietary consulting services to a client base spanning five continents. CAHA's projects, consulting, newsletters and market reports require regular communication with knowledgeable contacts at scores of companies, enlarging our understanding and refining and enhancing our extensive industry database.

This study is designed to provide insights and understanding that will enable clients to be more knowledgeable and successful market participants. There are two delivery options — hard copy or electronic version, via the internet (see the Cost and Delivery section).

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WORLD - DETERGENT-RANGE ALCOHOL (C ₁₂₊) PRODUCTION BY REGION, 1992-2020 (thousand tons)								
Region	1992	2000	2005	2006	2010	2015	2020	AAGR % 2005-2015
North America								
West Europe								
Asia								
Other Regions								
TOTAL								

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WORLD - DETERGENT-RANGE ALCOHOL (C ₁₂₊) PRODUCTION BY TYPE, 1992-2020 (thousand tons)								
Type	1992	2000	2005	2006	2010	2015	2020	AAGR % 2005-2015
Synthetic alcohol								
Oleo alcohol								
TOTAL								

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(thousand tons)					
Producer	Location	1992	2000	2005	2006F
OLEO ALCOHOLS					
TOTAL OLEO					
SYNTHETIC ALCOHOLS					
TOTAL SYNTHETIC					
GRAND TOTAL					
F = Forecast					

Table IV-7							
WEST EUROPE - HIGHER ALCOHOL DEMAND FORECAST, 2000-2020 (thousand tons)							
	2000	2005	2006	2010	2015	2020	AAGR % 2005-2020
Alcohol ethoxylates							
Alcohol ether sulfates							
Alcohol sulfates							
Subtotal							
Nitrogen Derivatives							
Quaternary ammonium compounds							
Amine oxide							
Other ADMA derivatives							
Subtotal Nitrogen Derivatives							
Other Intermediates							
Alkylpolyglycosides							
Methacrylate esters							
Sulfosuccinates							
Others							
Subtotal Others							
Direct End Uses							
Personal Care							
Other							
Unspecified Other							
TOTAL C ₁₂₋₂₂							

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	2000	2005	2006	2010	2015	2020	AAGR % 2005-2020
Household							
Personal Care							
Industrial ^a							
TOTAL ^b							

^a Included Industrial and Institutional cleaning and industrial processing aids.
^b Does not include AE consumed in AES production.

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Personal Care							
Industrial							
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North America							
West Europe							
Asia							
Other Regions							
TOTAL							

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ASIA - TOTAL PRIMARY SURFACTANT CONSUMPTION IN PERSONAL CARE END USES, 2000-2020
(thousand tons)

	2000	2005	2006	2010	2015	2020	AAGR% 2005-2020
Linear alkylbenzene sulfonates							
Alcohol sulfates							
Alcohol ethoxysulfates							
Alcohol ethoxylates							
Alkylphenol ethoxylates							
TOTAL							

QUALIFICATIONS AND PERSONNEL

Colin A. Houston & Associates, Inc. was founded in 1971 to provide consulting services to the chemical industry worldwide. The primary area of expertise is 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 oilfield chemicals, 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, West Europe, Asia/Pacific, the Middle East and Africa.

CAHA completed its first global higher alcohols multiclient study in 1980, and covered higher alcohols and related issues in several major multiclient studies during the 1980s including *Oleochemical Developments* (1984) and *Surfactant Intermediates and Soap - World Balances* (1984). Two additional comprehensive global higher alcohols studies were completed in 1990 and 1995, and in 2000, CAHA published *Higher Alcohols: Market Forecast to 2010*. These multiclient studies provide an unparalleled database, and CAHA's newsletters and ongoing consulting work in surfactant intermediates and surfactants provide a worldwide network of up-to-date contacts.

The project team approach utilized by CAHA includes a core of senior and technical professionals augmented by expert consultant associates. The following synopses present the staff and consultants who carried out the study, *HIGHER ALCOHOLS - FORECAST TO 2020*.

Joel H. Houston, President,

was the project leader for HIGHER ALCOHOLS - FORECAST TO 2020 and numerous other multiclient studies including HIGHER ALCOHOLS: MARKET FORECAST TO 2010, SURFACTANTS FOR EMERGING MARKETS IN ASIA/PACIFIC, 1996-2010, OPPORTUNITIES IN PERFORMANCE SURFACTANTS IN THE U.S., SURFACTANTS FOR CONSUMER PRODUCTS - NORTH AMERICAN FORECAST TO 2008, and DETERGENT ALKYLATE - WORLD MARKETS, 1992-2005. He has guided CAHA's research in oleochemicals since 1980, and in detergents since 1987. Mr. Houston has extensive experience in projects for consumer products, has presented papers at CMRA, ECMRA and CSMA meetings, and is the editor of CAHA's global detergent newsletter, AGGLOMERATIONS, THE LAB MARKET REPORT and

SURFACTANT DEVELOPMENTS NEWSLETTER. He is a member of CDMA, AOCS and ASTM.

Marilyn L. Bradshaw, Vice President,

authored sections of HIGHER ALCOHOLS - FORECAST TO 2020. She was the project leader for ALPHA-OLEFINS - WORLD MARKETS 2000-2010, INDUSTRIAL APPLICATIONS OF SURFACTANTS - NORTH AMERICAN FORECAST TO 2010 and POLYOLEFIN COMONOMERS - WORLD MARKETS, 1995-2005. Other recent multiclient studies she has directed include THE U.S. METALWORKING INDUSTRY AND SURFACTANT CONSUMPTION, 1995-2005, and U.S. I&I CLEANING PRODUCTS - SURFACTANT SUPPLIERS AND CUSTOMERS. 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.

H. James Bigalow, Senior Research Associate,

authored several sections of HIGHER ALCOHOLS - FORECAST TO 2020 and ALPHA-OLEFINS - WORLD MARKETS, 2000-2010 AND ALPHA-OLEFIN MARKET INTELLIGENCE DATABASE. In addition he has contributed to numerous multiclient studies including INDUSTRIAL APPLICATIONS OF SURFACTANTS - NORTH AMERICAN FORECAST TO 2010, SURFACTANTS FOR EMERGING MARKETS IN ASIA/PACIFIC, 1995-2010, DETERGENT ALKYLATES - WORLD MARKETS, 1995-2010 and SURFACTANTS FOR CONSUMER PRODUCTS - NORTH AMERICAN FORECAST TO 2008. Mr. Bigalow has also 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.

John Rapko, Senior Research Associate

authored the Higher Alcohols Technology section of HIGHER ALCOHOLS - FORECAST TO 2020 report and has also assisted on numerous proprietary reports. In Dr. Rapko's 32 years of professional experience he has directed the work of professional chemists and chemical engineers at all degree levels in the

areas of process development, chemistry, engineering and assessment of technologies related to the manufacture of detergent alkylate, detergent builders, zeolites, dehydrogenation catalysts, antimicrobials, amines, amino acids, chlorophenols, alkylphenols and alkylphenol ethoxylates, methyl ester sulfonates, phosphonates, bleaches and bleach ingredients, bleach activators, polymeric sequestrants and deflocculants, phosphorus chemicals, synthesis of ¹⁴C labeled materials for environmental assessment, waste minimization and remediation including incineration and processes for sulfuric acid recovery, construction and operation of bench scale evaluation and pilot units, project economics and start-up of commercial scale units. He holds a Ph.D. and B.S. in Chemistry (ACS Certified) from St. Louis University.

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