

# Surfactant Developments

A quarterly newsletter covering primary surfactants

Sample

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## End Use and Customer News

### **Bidco Africa Starts New Detergent Plant in Kenya**

Bidco Africa started up a new Sh2 billion (\$190 million) detergent plant in Thika, Kenya and launched a new washing powder under the Msafi® brand. The plant will initially produce 3,000 tons of detergents per month. The prices of Msafi® washing powders will range from Sh5 to Sh140. The plant is part of Bidco's plan to invest Sh20 billion to expand into new categories.

### **Unilever Agrees to Acquire Sundial Brands**

Unilever has agreed to acquire Sundial Brands, a multicultural hair care and skin care company with brands that include SheaMoisture®, Nubian Heritage® and Madame C.J. Walker Beauty Culture®. Sundial, whose turnover is expected to reach about \$240 million this year, will remain a standalone unit.

### **Kao Doubles Consumer Products Factory Capacity in Taiwan**

Kao has completed the construction of a new production facility, doubling the capacity of finished beauty care products at its plant in Hsinchu, Taiwan. The company spent approximately 3.3 billion yen for the new facility. The facility will start producing four skin care and hair care brand products with plans to add more products as time passes. Kao's Hsinchu plant produces skin care, hair care, laundry detergent and sanitary products throughout its facilities.

### **Cleaning Product Right to Know Act Passed in California**

The Cleaning Product Right to Know Act of 2017 was signed by California's governor in October. The bill requires that producers of designated products (air care, automotive, general cleaning or polish or floor maintenance products that are used for domestic, institutional or janitorial cleaning) provide certain product information, such as safety data sheets, on their website by 2020. The manufacturers also have to list certain chemical ingredients on their product labels by 2021. California is the first U.S. state to mandate that consumer cleaning product manufacturers label ingredients on both the products packages and their websites.

### **Trian Partners' Nelson Peltz to Be Given Seat on P&G Board**

Nelson Peltz will be added to P&G's board of directors on March 1, 2018 despite losing a proxy fight for an existing seat. The proxy fight, held in October, ended with Ernesto Zedillo (the lowest voted-for current board member) receiving 973.26 million votes and narrowly beating Peltz's 972.77 million votes. Trian Partners, Peltz's investment fund that spent \$3.5 billion in February to gain 1.5 percent of P&G shares, believes that P&G has been underperforming in relation to its peers and wants it to regain market share as well as create long-term value. One of the changes advocated by Peltz is for P&G to reorganize from ten business units to three. Trian Partners and P&G both spent millions towards shareholder outreach before the proxy vote, with P&G spending over \$35 million. Joseph Jimenez, CEO of Novartis, will also be added to the board of directors next March.

### **Walmart to Reduce High-Priority Chemicals in Consumables by Ten Percent**

Walmart announced its new goal to reduce NPE and seven other high-priority chemicals, which the company first publicly listed in 2016, in consumable products by ten percent by 2022. Walmart wants suppliers to phase out the high-priority chemicals from cleaning, personal care and beauty products sold at Walmart and Sam's Club stores in the United States. Walmart will also require manufacturers to list the high-priority and other priority chemicals on the packages of products that contain them as well as on their websites by 2018. In September, the retailer claimed that, to date, the weight of high-priority chemicals in consumable products sold in U.S. Walmart stores had been decreased by 96 percent.

### **Home Depot Reveals New Chemical Strategy**

The Home Depot revealed its new chemical strategy in October. The company is committed to eliminating APE from latex water-based wall paint formulations in U.S. and Canadian stores by the end of 2019. NPE is already excluded from indoor wall-to-wall carpet in U.S. and Canadian stores.

### **PSMA Asks for Pakistan's Anti-Dumping Duty on LABSA to Be Removed**

The Pakistan Soap Manufacturers Association (PSMA) has asked that the duty imposed on sulfonic acid imports be removed, stating that it has caused prices of the chemical to rise by Rs15 per kg. The organization claimed that out of the 46,252 tons of LABSA consumed in the country, only 28,800 tons are produced locally. On May 25, 2017, the National Tariff Commission of Pakistan had imposed a provisional anti-dumping duty ranging from 3.21 to 37.51 percent on LABSA imports stemming from China, Chinese Taipei, South Korea, India, Indonesia and Iran. The commission was expected to make its final decision on the LABSA anti-dumping duty within 180 days of imposing the provisional duty.

### **Canada Chooses not to Regulate Sodium C<sub>14-16</sub> Olefin Sulfonate and Three Alkyl Sulfates**

The Canadian government has announced that it will not be regulating four surfactants because screening assessments did not find high health or environmental risks. The four surfactants consist of one alpha olefin sulfonate (sodium C<sub>14-16</sub> olefin sulfonate) and three alkyl sulfates (ammonium lauryl sulfate, sodium lauryl sulfate and TEA lauryl sulfate).

### **SC Johnson to Acquire Method® and Ecover®**

SC Johnson has agreed to acquire the Method® and Ecover® brands from People Against Dirty. Ecover®, founded in Belgium in 1979 as a pioneer in environmentally-friendly detergents, sells 35 green cleaning products in 40 countries. Method®, founded in the U.S. in 2001, sells green fabric care, home care and personal care products.

### **Golden Agri-Resources Added to Dow Jones Sustainability Index**

Golden-Agri Resources has become the first palm oil company to be listed under the Food, Beverage & Tobacco sector of the Dow Jones Sustainability Asia Pacific Index. The Dow Jones Sustainability Indices were launched in 1999 as global sustainability benchmarks. Golden-Agri Resources' sustainability efforts have included designating an area the size of Singapore for conservation, using methane capture facilities and recycling all of its production waste.

### **Henkel Chooses Not to Acquire a 26 Percent Stake in Jyothy Labs**

Henkel chose not exercise its option to acquire a 26 percent stake in Jyothy Laboratories. Jyothy Labs had bought out Henkel's 50.97 percent stake in Henkel India Ltd. in May 2011, increasing its ownership to 65.87 percent and giving it detergent brands Henko®, Mr. White® and Chek® and personal care brands Margo®, Neem® and Fa®. As part of the deal, Henkel had the option to consider acquiring up to 26 percent of Jyothy Labs five years after the acquisition. Henkel began exclusive talks to buy stake in Jyothy Labs during June 2016, and the deadline for exclusivity was extended from March 2017 to October 2017. Jyothy Labs is continuing its licensing agreement to sell Henkel brands Pril® and Fa® with royalties set at two percent of revenue.

### **Henkel States Intentions to Continue Operating in Iran**

Despite U.S. tensions with Iran over the existing nuclear arms treaty, Henkel has stated that it continues to see potential in the Iranian market and intends to keep operating in the country. As recently as 2016, Henkel acquired Behdad Chemical Company's Iranian detergent business as well as spent €62 million to increase its stake in Tehran-based Henkel Pakvash to 97.98 percent.

### **RB to Reorganize Business Segments**

Reckitt Benckiser (RB) plans to reorganize into two business units effective January 1, 2018. The current Health category will be merged with some hygiene products to form the Health business unit, and the Home category and the rest of the Hygiene category will be merged to form the Hygiene Home business unit. The Health business unit, which will include the Mead Johnson acquisition made in June, would make up about 60 percent of the company's revenue.

### **UK to Continue Enforcing REACH Registration but Tax Uncertainty Remains**

The United Kingdom will continue to enforce REACH, meaning domestic chemical manufacturing companies that do not export into the European Union and importers from non-EU countries will still have to meet the May 31, 2018 deadline for the registration of chemicals with a total weight of 1 to 100 tons produced or imported into the current European Union countries. Regardless, much uncertainty remains as customs and tax schedules will need to be setup, and under existing WTO rules, taxes will have to be paid before rather than after transactions. One result of the uncertainty is that Unilever has delayed its decision on whether to locate its headquarters in the UK or in The Netherlands.

## Surfactant Producer News

### KLK to Acquire Elementis Specialties in The Netherlands

Kolb Distribution AG, a subsidiary of KLK Oleo, has reached an agreement with Elementis plc to acquire the surfactants division located in Delden, The Netherlands for €39 million (\$46 million). The plant in Delden was acquired by Elementis Specialties from Sasol (Sasol Servo B.V.) in 2004 and has alkoxylation and sulfation/sulfonation capacities of 15,000 tons and 5,000 tons, respectively. The surfactants division was responsible for only six percent (\$43.1 million) of Elementis revenue in 2017 and is considered a non-core business. The small range of specialty chemicals which were manufactured at Delden will continue to be supplied by Kolb to Elementis under a long-term supply agreement.

### Tufail to Expand LABSA Capacity in Pakistan

Tufail Chemical Industries has announced plans to expand its sulfonation capacity from 60,000 tons to 100,000 tons per year by mid-2018. The company is planning to export LABSA to Africa, Bangladesh, Turkey and the U.A.E. after the expansion. The bulk of the company's current production capacity is consumed locally in Pakistan.

### Huntsman and Clariant Drop Plan to Merge

Huntsman and Clariant have agreed to terminate their plan for a merger of equals due to actions taken by activist investor White Tale Holdings. White Tale reportedly raised its stake in Clariant to over 20 percent in an effort to halt the transaction, which it believed undervalued Clariant. As the opposition is now supported by other shareholders, Clariant believed obtaining the required two-thirds shareholder approval would have proven difficult. The merged company, HuntsmanClariant, would have been worth an estimated \$20 billion with some \$3.5 billion of added value post-merger. The merger transaction, first announced in May, was expected to close by the end of 2017.

### Croda Completes Bio-EO Project in U.S.

On October 18, 2017, Croda Inc. held a ribbon cutting ceremony to celebrate the completion of its ethanol-to-EO plant at its site in New Castle, DE. The estimated 30,000 tons of EO will be used at its adjacent 59,000 ton ethoxylation unit to produce nonionic surfactants. Construction on the \$170 million project began in April 2015. This unit is the first of its kind in the U.S. Similar facilities are already in use in Asia.

### Croda Completes Alkoxylation Unit in France

In September, Croda inaugurated its new alkoxylation plant in Chocques, France. The new unit expanded capacity for nonionic surfactants by 20 percent. Construction began in March 2016 on the \$21.3 million facility.

### BASF to Acquire Part of Bayer's Agricultural Seed and Chemicals Business.

In October, BASF signed an agreement to acquire a portion of Bayer's agchem business. The deal includes LibertyLink, which includes Liberty® glufosinate herbicide, canola seed in Europe and North America, cotton seed (excluding India and South Africa), and global soybean seed businesses. The deal is worth €5.9 billion (\$7.0 billion).

### Saudi Kayan Shutdown to Increase EO Capacity

Saudi Kayan shut down much of its capacity from mid-November to late December to perform maintenance on its ethane cracker and upgrade ethylene capacity to 93,000 tons and EO to 61,000 tons.

### Evonik Reorganizes

Other than a cost goal and plans to reduce headcount, Evonik provided no details on its plan to reduce costs by €200 million per year. The company stated it had identified ways to save €50 million in 2018.

### Vantage Specialty Chemicals Reacquired by H.I.G.

Vantage, a manufacturer of fatty acids and glycerine in Chicago, IL, was sold by H.I.G. Capital to the Jordan Company in 2012. H.I.G. has signed an agreement to repurchase Vantage from the Jordan Company, with Jordan retaining a minority share. The deal is reportedly worth about \$1 billion.

### Maschem Acquires Campi Y Jové Plant in Spain

Maschem B.V., a Musim Mas subsidiary, has acquired a 20,000 ton sulfation/sulfonation plant in Barbastro, Spain from Campi y Jové Easy Solutions. The plant's products - including LABSA, SLES and SLS - are marketed under brand names Easycol® and Easylan® for personal care, cosmetics and home care applications. The plant, which will become part of Maschem subsidiary Masphate S.L.U., has been running since 2009 and has customers in the Mediterranean and Maghreb regions.

### Galaxy Makes IPO

Galaxy Surfactants Pvt Ltd has filed draft initial public offering papers with regulators in India. The draft plan includes an initial offering from 307 shareholders to sell 6,331,674 shares. The stated value of each share is Rs 10. The IPO hopes to eventually raise Rs 1,000 crore (Rs 10 trillion, or \$152.7 million). Galaxy issued an IPO in 2011 which received bids for 1.48 million shares out of 50.4 million shares offered at a range of Rs 3.25-340 (\$7.24-\$7.57) per share, and was subsequently withdrawn. The company has ethoxylation and sulfation capacities at several sites in India and one in Egypt, producing a variety of surfactants for personal care and household care markets, supplying Colgate, Unilever, Henkel and RB. The company is headquartered in Navi Mumbai, India and has international sales offices in the U.S., Colombia, Turkey and the Netherlands.

### Lion and Wilmar Agree to Form MES JV

Wilmar International and Lion Corporation have entered into a conditional joint venture agreement to manufacture and market methyl ester sulfonates (MES) through a new investment holding company. The new JV will be the second largest producer of MES, operating more than 25 percent of the global installed capacity.

KOG Investments Pte Ltd (KOGI), a wholly owned subsidiary of Wilmar International, operates a 40,000 ton MES unit in Gresik, Surabaya, Indonesia. The unit was originally commissioned in 2013 for P.T. Wilmar Nabati Indonesia using Chemithon's continuous air/SO<sub>3</sub> sulfonation process, methyl ester acid bleach system and Turbo Tube® dryer system. Methyl ester feedstocks are sourced from the same location. KOGI will incorporate an investment holding joint venture company in Singapore, which will subsequently incorporate an operating company in Indonesia to acquire the MES unit at Gresik.

Lion Eco Chemicals Sdn Bhd (LECO), a Malaysian private limited subsidiary of Japan's Lion Corporation, was established in 2007 in Pasir Gudang, Johor Barhu, Malaysia. The company commissioned a 25,000 ton MES unit in 2010 based on Ballestra and Lion proprietary process technologies. The plant was expanded in 2014 to reach 50,000 tons. Feedstocks are typically sourced from P.T. Wilmar Nabati Indonesia's Gresik processing site. LECO will be acquired by the new JV, with the former private limited company taking a 50 percent share of the new holdings company in exchange for the fixed asset value of the MES unit at Johor.

### Stepan Acquires BASF Sulfation Unit in Mexico

In June, Stepan announced that its Mexican subsidiary had reached an agreement with BASF Mexicana, S.A. de C.V. to acquire its 56,000 ton sulfation unit (estimated) surfactant production facilities in Ecatepec, Mexico and a portion of its associated surfactants business. The plant was a part of BASF's Care Chemicals division, which provides surfactants for personal care, hygiene, home care, industrial & institutional cleaning and some technical applications. Financial details of the transaction were not disclosed. Plant operations will be fully transferred to Stepan pending the deal's completion, expected in Q4 2017. Besides sulfonation/sulfation capacity, the site has ethoxylation units. However, the ethoxylation portion is expected to be mothballed.

### Sinar Mas Inaugurates Fatty Alcohol Plant in Indonesia

On September 14, 2017, Sinarmas Cepca Pte Ltd., a JV between Golden Agri-Resources Ltd and CEPSCA Química, S.A., inaugurated its new 160,000 ton C<sub>6-18</sub> (146,000 ton C<sub>12+</sub>) Lurgi wax ester unit in Dumai, Indonesia. The \$300 million plant will source PKO from Golden Agri's adjacent refinery and PK crushing plant. The plant was announced in January, 2014 along with an adjacent \$100 million 40,000 ton fatty acid plant which was also started.

### New Ethoxylation Reactor Shipped to Oxiteno Site in the U.S.

In July, thyssenkrupp Industrial Solutions AG shipped two alkoxylation reactors from its manufacturing site in Map Ta Phut, Thailand to Oxiteno USA. The plant had been fully assembled, inspected, disassembled, then shipped. A total of 15 modules and three filtration vessels were shipped from Thailand, arriving at Oxiteno's plant in Pasadena, TX in August. The two 60,000 ton reactors use jet loop technology which thyssenkrupp acquired from Inventa Technologies (Singapore) in 2015. The new technology claims lower residual alkylene oxide levels and faster reaction times compared to conventional stirred reactors. The reactors also allow the flexibility to generate the smaller batch sizes of specialty chemicals that Oxiteno, in part, intends to add to its portfolio. The facility is expected to be mechanically complete in Q1 2018 and ready to operate in Q2 2018.



## Financial Results

Note: Unless otherwise noted, results are for the second quarter of 2017 and percent changes are between the second quarter of 2016 and second quarter of 2017. The following table shows exchange rates as of June 30, 2017 for currencies quoted below.

Dollar Exchange Rates as of June 30, 2017					
Euro	€	0.88	Malaysian Ringgit	RM	4.29
Swiss Franc	CHF	0.96	Brazilian Real	R\$	3.29
Indian Rupee	Rs	64.55	South African Rand	R	12.96

**AzoNobel** - Revenue +2% to €3,785 million, EBIT -6% to €461 million. Revenue for the Specialty Chemicals division increased four percent to €1,259 million primarily due to higher sales volumes and favorable price/mix effects. EBIT for the division stayed stable at €179 million. The Surface Chemistry segment of the Specialty Chemicals division saw revenue rise by six percent to €282 million due to higher sales volumes and favorable currency effects.

**BASF** - Sales +12% to €16.3 billion, EBITDA +16% to €3.3 billion. BASF's Performance Products segment sales increased by four percent to €4,142 million mainly due to higher sales volumes. The segment's EBITDA decreased 14 percent to €609 million. The Care Chemicals division, which resides inside the Performance Products segment, saw sales rise by seven percent to €1,263 million as a result of higher prices and sales volumes as well as favorable currency effects.

**Clariant** - Sales +8% to CHF1,530 million, EBITDA (before exceptional items) +8% to CHF232 million. Exceptional items refer to manufacturing, impairment and transaction-related costs as well as any impairment, gain or loss on disposals. Sales by the Care Chemicals business area increased five percent to CHF 356 million, and rose by eight percent in local currencies, and were supported by the Industrial Application and Crop Solutions businesses. The Care Chemicals business' EBITDA (before exceptional items) fell by 19 percent to CHF59 million.

**Church & Dwight** - Net Sales +2.3% to \$898 million, Gross Profit +0.6% to \$410 million. In the Consumer Domestic segment, net sales increased 1.3 percent to \$678 million partially due to higher sales of Arm & Hammer® liquid and unit dose laundry detergents, Oxiclean® laundry detergent and Batiste® dry shampoo. The Consumer International segment reported a 6.4 percent increase in net sales to \$145 million due to increased sales of various products in the export business, Mexico and Australia.

**Colgate-Palmolive** - Net Sales -0.5% to \$3,826 million, Operating Profit -9.6% to \$853 million. The Oral, Personal and Home Care segment's net sales decreased 0.5 percent to \$3,254 million due to lower sales volumes and adverse currency effects. The segment's organic sales stayed stable.

**Henkel** - Sales +9.6% to €5,098 million, Operating Profit +10.8% to €839 million. Sales from the Laundry & Home Care segment increased 26.6 percent to €1,703 million primarily due to the acquisition of The Sun Products Corporation. Organic sales growth for the segment was reported at 2.1 percent and driven by emerging markets. Sales from the Beauty Care segment increased 0.9 percent to €997 million due to acquisitions and favorable currency effects.

**Hindustan Unilever** - Net Sales +4.8% to Rs 93.4 billion, EBITDA +14% to Rs 18.7 billion. Sales in the Home Care segment rose by 5.9 percent to Rs 30.5 billion due to growth in mass and premium laundry including higher sales volumes for Surf®. The segment's profits before tax and interest increased 25.8 percent to Rs 4.5 billion.

**Huntsman** - Revenue +3% to \$2,616 million, adjusted EBITDA +27% to \$413 million. The Performance Products segment's revenue decreased one percent to \$561 million. Huntsman divested its European surfactants business to Innospec in December 2016. If the divested business is excluded from results, Performance Products' revenue (pro forma) rose by 11 percent as a result of stronger sales volumes and prices. The segment's adjusted EBITDA increased 19 percent (or 31 percent pro forma) to \$102 million.

**KLK** - Revenue +24.2% to RM873 million, Pre-Tax Profit -35.9% to RM201.4 million. The Plantation sector's profit increased 8.3 percent to RM226.6 million and was driven by higher crude palm oil and palm kernel selling prices and FFB production. The Manufacturing sector saw revenue rise by 23.1 percent to RM 2,398 million due to higher selling prices. The sector experienced a loss of RM21.9 million as compared to a profit of RM103.3 million during Q2 2016. There was high volatility in raw material (crude palm kernel oil) prices, and market conditions caused customers of oleo products to be cautious with their buying strategy. The Oleochemicals division, which is part of the Manufacturing sector, reported a loss of RM26.1 million. Compared to a RM99.5 million gain in the previous year.

**Oxiteno** - Net Sales -3% to R\$885 million, EBITDA -71% to R\$34 million. The decrease in net sales was due to an eight percent stronger Real against the U.S. Dollar despite higher selling prices in terms of U.S. Dollars. Total sales volumes decreased one percent, but specialty chemicals volumes increased three percent. Sales of specialty chemicals outside of Brazil rose by four percent largely due to pre-marketing activities for Oxiteno's new ethoxylation facility in Pasadena, TX, U.S., which is expected to start up in 2018.

**Procter & Gamble** - FY2017 Net Sales +0% to \$65,058 million, Operating Income +4% to \$13,955 million. Fabric Care and Home Care net sales declined 0.1 percent to \$20,717 million as a result of adverse currency effects and lower sales volumes. The segment's organic sales rose by one percent. Net sales for the Beauty segment decreased 0.4 percent to \$11,429 million due to lower sales volumes and adverse currency effects. The segment's organic sales increased three percent.

**Sasol** - FY 2017 Turnover -0.3% to R172,407 million, EBITDA -7.9% to R49,751 million. The Performance Chemicals business unit saw revenue decline 4.8 percent to R67,806 million as ammonia and phenolics prices decreased. The business unit's operating profit decreased by 11.3 percent to R10,000 million. However, when normalized, the Performance Chemicals operating profit increased two percent. Performance Chemicals sales volumes rose two percent primarily as a result of improved demand and operational stability.

**Solvay** - Net Sales +11% to €3,022 million, EBITDA +4.6% to €615 million. The Novecare business' net sales increased 24 percent to €496 million due to higher volumes, which were driven by a recovery in the North American oil and gas industry and growth in agriculture markets.

**Stepan** - Net Sales +9% to \$495 million, Operating Income -9% to \$39 million. Net sales for the Surfactants division increased ten percent to \$329 million due to higher selling prices. The Surfactant division's operating income increased 14 percent to \$31 million mainly driven by improved product mix, lower manufacturing costs that were related to the company's closures in Canada and Brazil, and previous acquisitions in Brazil.

**Unilever** - Turnover +4.9% to €14,406 million. Underlying sales growth was three percent. The Personal Care division saw turnover increase by 6.3 percent to €5,340 million due to more favorable exchange rates, acquisitions and higher sales prices. Turnover for the Home Care division increased 7.5 percent to €2,688 million due to market development and innovations for emerging needs. The Personal Care division's underlying sales increased 2.2 percent and the Home Care division's underlying sales increased 2.5 percent.

**Wilmar International Limited** - Revenue +13.2% to \$10,599 million, EBITDA +649.6% to \$308 million. The Manufacturing & Merchandising section of the Tropical Oils segment saw revenue increase 7.3 percent to \$4,453 million. The Plantation section of the Tropical Oils segment reported a 14.5 percent decrease in revenue to \$11 million. Production yield of Tropical Oils rose 31.6 percent to 5.2 tons FFB per hectare due to the abatement of El Niño effects. Overall, Tropical Oils pre-tax profits fell 68.1 percent to \$59 million.

## Prices

Note: The following table presents current intermediate and surfactant prices. These prices are considered to be representative but some transactions might take place outside the ranges reported in this table. All prices, unless otherwise noted, are in U.S. dollars or euros, metric tons and have been converted 100 percent active.

WORLD INTERMEDIATES AND SURFACTANTS PRICING, SEPTEMBER 2017					
	Grade	North America <sup>a</sup> US\$	West Europe <sup>a</sup>		Asia <sup>b</sup> US\$
			Euro	US\$	
<b>INTERMEDIATES</b>					
LAB		\$ █/ton	€ █/ton	\$ █/ton	\$ █/ton
<b>SURFACTANTS</b>					
LABS Acid	100%	\$ █/lb	€ █/ton	\$ █/ton	\$ █/ton
AE	2 mole	\$ █/lb	€ █/ton	\$ █/ton	\$ █/ton <sup>c</sup>
AE	7 mole	\$ █/lb	€ █/ton	\$ █/ton	\$ █/ton <sup>c</sup>
AES	100%	\$ █/lb	€ █/ton	\$ █/ton	\$ █/ton <sup>c</sup>
AS	100%	\$ █/lb	€ █/ton	\$ █/ton	\$ █/ton <sup>c</sup>
NPE	9 mole	\$ █/lb	n.a.	n.a.	n.a.
Currency rates as of September 21, 2017: \$1= €0.896 €1= \$1.1905					
a Delivered prices					
b CIF (cost insurance and freight) Asua Sykfates & Ethox are FOB					
c FOB					

Crude oil prices have increased during September with Brent reaching a 26-month high of nearly \$█/bbl amid speculation that the global oil market is coming back into balance. In the U.S., more than 20 percent of the refining capacity was forced to shut from Hurricane Harvey in late August, however operations had largely restarted in early September. U.S. exports reached a record level in mid-September, amounting to 1.5 million barrels a day during the second half of the month. WTI prices pushed over \$█/bbl in mid-September for the first time since May.

Contract benzene prices in the U.S. increased between █¢ in September, settling at \$█/gal. In Europe, the September contract increased €█/ton to reach €█/ton. Asia contract prices increased \$65/ton to the \$810/level in September, with the South Korean spot offers averaging the same.

The U.S. ethylene contract has yet to settle for August, due to disruption from the hurricane and several cracker outages. The spot market has risen to █¢/lb in mid-September, up from an average of █¢/lb in August. European ethylene contract prices settled at

€█/ton in September, and an €█/ton increase has been announced for October.

PKO prices have seen a sharp upturn since August exceeding \$█/ton for a time in Rotterdam during September.

### INTERMEDIATES

#### Linear Alkylbenzene

During the third quarter, U.S. prices initially declined █¢/lb from June levels and then rolled over from July to August. September prices were quoted in the █¢/lb range delivered, increasing between █¢/lb delivered. The impact from Hurricane Harvey resulted in Huntsman's unit going into shutdown for close to a week, resuming production on September 6th. Sasol's LAB operation took a precautionary shutdown for half a day in late August. One U.S. producer has announced a █¢/lb increase for October prices, based on increasing feedstocks.

European LAB prices saw a €/ton decline in July, following a €/ton reduction in June, and took a rollover in August, however with to euro strengthening, LAB prices have increased some \$/ton in dollar terms. In September, a rollover was taken for the second month, yet due to currency affects, increased \$ in dollar terms.

In Southeast Asia, LAB prices started the third quarter in the \$/ton range CIF, decreasing \$/ton from June. Exports to India had slowed during the second quarter and into July, as large inventories were built prior to an Anti-Dumping Duty imposed in April and a new Goods and Services Tax starting in July. Softened demand in the region pressured prices down \$ to \$/ton in August to \$/ton. Feedstock prices started to rise during August, which resulted in a \$/ton increase in September, putting LAB in the \$/ton CIF range in Southeast Asia.

### **Detergent Alcohols**

Due to a sharp rise in feedstocks, mid-cut oleo alcohol prices increased in the second half of the third quarter, reaching levels as high as \$/ton FOB in Southeast Asia. In the U.S., an expectation that mid-cuts would fall to around ¢/lb during the third quarter was never met, partially impacted by supply disruptions caused by a producer outage and Hurricane Harvey. In Europe, prices during the third quarter climbed above the €/ton level, delivered seen in July. Despite upward price pressure from increasing feedstock costs, mid-cuts have only risen to around €/ton in September.

### **Alcohol Ethoxylates (Low Mole)**

Low mole mid-cut alcohol ethoxylates (ranging from 2 to 3 moles of EO) have seen an increase in the U.S. in September, with contract price levels ranging from ¢/lb to the high ¢/lb range for oleo types. Producer outages during the third quarter have reduced availability. In Europe, mid-cut oleo low mole AE has fallen to €/ton, delivered in September. In Asia, low-mole AE has increased \$/ton in September to a range of \$/ton in September, due to increasing feedstock costs.

## **SURFACTANTS**

### **Linear Alkylbenzene Sulfonates**

LABSA prices in the U.S. have remained flat during the third quarter in the mid-to-high ¢/lb range on a 96 percent basis, with large volume customers reaming below ¢/lb. European LABSA prices have decreased €/ton during the third quarter to €/ton delivered on a 96 percent basis. In Asia, LABSA (96 percent) prices have increased to \$/ton range in September, as the spot supply of export volumes from Indian sulfonators has softened.

### **High-Mole Alcohol Ethoxylates**

In the U.S., high mole AE prices are in the ¢/lb range in September. In Europe, prices have decreased around €/ton from Q2 levels to a range of €/ton delivered in September. In Asia, high mole ethoxylates have risen since August where a range of \$/ton is seen in September from Southeast Asian suppliers on an FOB basis.

### **Alcohol Ether Sulfates**

In the U.S., high active (70 percent basis) AES prices decreased below ¢/lb for a time during the third quarter. A ¢/lb increase was announced for October 15<sup>th</sup> for low active and high active AES products. In Europe, high active AES prices softened to €/ton (70 percent basis) in September. In Asia, a wide range of \$/ton exists for the high active 70 percent AES materials in September, increasing \$/ton from the second quarter.

### **Alcohol Sulfates**

In the U.S., AS price levels were flat from the second to third quarter, with a ¢/lb increase announced for October 15<sup>th</sup>. European low active materials (30 percent basis) were reported in the €/ton range delivered. In Asia, low active AS prices increased \$/ton during the third quarter and are reported in the range of \$/ton in September for 30 percent active material.

### **Alkylphenol Ethoxylates**

NPE prices in the U.S. saw a sharp rise during September, with one producer increasing a total of ¢/lb via two announced increases. Phenol and EO feedstocks have been in short supply, impacted by damage from the hurricane.

## Technology Review

### **Compositions Containing Alkyl Sulfates and/or Alkoxyated Alkyl Sulfates and a Solvent Comprising a Diol.**

Jeffrey John Scheibel, Scott Leroy Cron, Patrick Christopher Stenger, Praveen Kumar Depa. The Procter & Gamble Company. U.S. Pat. 9790454 B2, 10/17/17. The present invention relates generally to compositions containing an anionic surfactant selected from the group consisting of alkyl sulfates, alkoxyated alkyl sulfates, and mixtures thereof, and a solvent, particularly a solvent comprising one or more diols. The detergent is a liquid or gel (30-75% anionic surfactant). The alkyl groups are linear or branched. The diol solvents provide lower cost and higher storage stability.

### **Alkyl Polyglycoside Derivative as Biodegradable Spacer Surfactant.**

Ramesh Muthusamy, Abhimanyu Pramod Deshpande, Rahul Chamdrakant Patil, Sandip Prabhakar Patil. Halliburton Energy Services, Inc. U.S. Pat. 9796901 B2, 10/24/17. A spacer fluid comprising water and an alkyl polyglycoside derivative, wherein the alkyl polyglycoside derivative is selected from the group consisting of sorbitan fatty acids; functionalized sulfonates, functionalized betaines, an inorganic salt of any of the foregoing, and any combination of any of the foregoing. Preferably, the spacer fluid additionally comprises a solid particulate, such as a weighting agent. A method of displacing an oil-based drilling mud from a portion of a well comprising the steps of: (A) forming the spacer fluid; and (B) introducing the spacer fluid into the well.

### **Catalyst Compositions, Methods of Preparation thereof, and Processes for Alkoxyating Alcohols using such Catalysts.**

Kenneth L. Matheson, Kip Sharp, Teresa L. Marino, Shane F. Cutrer, Allan B. Hauser, Tamra R. Weemes, Steve C. Lyons, Geoffrey Russell, Qisheng Wu, Harald Kohnz, Ollie M. James, Cecil C. Mercy, Herbert Olin Perkins. Sasol. U.S. Pat. 9802879 B2, 10/31/17. A process of preparing an alkoxylation catalyst wherein a catalyst precursor - which is formed from an alkoxyated alcohol, calcium hydroxide, carboxylic acid, inorganic acid, and propylene oxide - is mixed with an antioxidant, preferably butylated hydroxyl toluene (BHT). A process of alkoxylation using the catalyst of the present invention is described. BHT prevents isomerization of n-alcohols during alkoxylation and reduces alcohol vapor pressure in the reactor, allowing faster reaction rates.

**Liquid Hand Soaps and Body Washes.** Paloma Pimenta, Darrick Carlone, Emma Alvarado, Subhash Harmalker, Marian N. Holerca, Evangelia S. Arvanitidou. Colgate-Palmolive Company. U.S. Pat. 9820924 B2, 11/21/17. The disclosure provides a liquid hand soap or body wash, comprising (i) a surfactant system comprising 5.5-6.5% C<sub>8-18</sub> alkyl-ether sulfate, 1.5-2.4% cocamidopropyl betaine (CAPB), and 0.2-0.5% N-(2 hydroxyethyl) fatty acid amide; (ii) a polyethylene oxide-polypropylene oxide block copolymer; and (iii) one or more polyalkoxyated mono- or di-fatty acid esters or amides, the composition allowing reduced surfactant levels, while still having good rheological properties.

**Shampoo Composition.** Zhengrong Li, Xuemiao Pan. Conopco, Inc., d/b/a Unilever. U.S. Pat. Appl. 2017/0224607 A1, 8/10/17. Disclosed is a shampoo comprising from 1 to 15 wt% alkyl sulfate surfactant, ethoxylated alkyl sulfate surfactant or mixture thereof; from 0.5 to 12 wt% fatty acyl isethionate; and from 0.01 to 2 wt% cationic polymer, wherein the cationic polymer comprises cationic galactomannan and cationic cellulose. The shampoo is substantially free of silicone conditioning agent.

### **Use of Branched Alcohols and Alkoxyates Thereof as Secondary Collectors.**

Natalija Smolko-schvarzmayr, Anders Klingberg, Elisabeth Henriksson, Henrik Nordberg. Akzo Nobel Chemicals International B.V. U.S. Pat. Appl. 2017/0252753 A1, 9/7/17. The present invention relates to the use of branched fatty alcohol-based compounds selected from the group of fatty alcohols with 12-16 carbon atoms having a degree of branching of 1-3, and their alkoxyates with a degree of ethoxylation of up to 3, as secondary collectors for the froth flotation of non-sulfidic ores, in combination with a primary collector selected from the group of amphoteric and anionic surface active compounds. This is a substitute for NPE in collection of phosphates, with some of the AE working as well as NPE-2. The branched AE frothing collapses faster than linear AE, which is better for the overall process.

### **Production of Fatty Acids and Derivatives Thereof.**

Jay D. Keasling, Zhihao Hu, Chris Somerville, George Church, David Berry, Lisa C. Friedman, Andreas Schirmer, Shane Brubaker, Stephen B. Del Cardayre. REG Life Sciences, LLC. U.S. Pat. Appl. 2017/0275651 A1, 9/28/2017. Compositions and methods for production of fatty alcohols using recombinant microorganisms are provided as well as fatty alcohol compositions produced by such methods.

**Stable Liquid Detergent Composition Containing a Self-Structuring Surfactant System.** Liangjing Fang, Ming Tang, Karl Shiqing Wei, Peng Qin, Ting He. The Procter & Gamble Company. U.S. Pat. Appl. 2017/0292097 A1, 10/12/17. A stable liquid detergent composition containing a self-structuring surfactant system where, without using external structurants, the liquid detergent composition exhibits good shear thinning properties while maintaining stability under high shear. A liquid detergent composition comprising 6-20% linear alkyl benzene sulfonate, a zwitterionic and/or amphoteric surfactant and optionally polyethylene glycol.

**Surface Active Agents Derived From Biodiesel-Based Alkylated Aromatic Compounds.** George A. Smith, Daniel R. Weaver, Zheng Chai. Huntsman Petrochemical LLC. U.S. Pat. Appl. 2017/0305844 A9, 10/26/17. A surface active agent comprising an arylated methyl ester of a fatty acid, or mixture of fatty acids, derived from biodiesel or a triglyceride source is disclosed. The fatty acid mixture is condensed to methyl esters and alkylated with aromatic substituents under Friedel-Crafts conditions. The alkylated methyl esters may be alkoxyated using a catalyst derived from fatty acids, alkaline earth salts, and strong acids. The resulting nonionic surfactant may also be sulfonated to produce one class of anionic surfactants. The alkylated methyl esters may also be directly sulfonated to produce another class of anionic surfactants.

**Biosurfactant-Containing Formulation.** Jörg Peggau, Ulrike Kottke, Hans Henning Wenk, Dirk Kuppert, Jochen Kleinen. Evonik Degussa GMBH. U.S. Pat. Appl. 2017/0306264 A1, 10/26/17. The present invention further relates to a biosurfactant-containing formulation including A) at least one biosurfactant, and B) at least one additional surfactant selected from the group of betaines, alkoxyated fatty alcohol sulphates and alkylamine oxides, wherein the biosurfactant-containing formulation may be used on hard surfaces. Sophorolipids preferred over rhamnolipids. 1-20% C<sub>12-14</sub> AES with 2-4 moles EO preferred over betaines. Useful for hand and dish soap. Has low skin irritation, fast and high foam, good run-off and good drying.

**Stable, Concentrated Herbicidal Compositions.** David A. Long. Bayer Intellectual Property GmbH. U.S. Pat. Appl. 2017/0332628 A1, 11/23/17. A liquid herbicidal composition is provided, comprising 20 to 35 percent by weight, based on the total weight of the composition, of a water-soluble herbicidal ingredient (glufosinate or salt thereof); 10-35% C<sub>12</sub>-C<sub>16</sub> alkyl ether sulfate with 2-4 moles EO, an organic solvent, and 1-15% alkyl polyglucoside. The composition is stable; i. e., it occurs in a substantially continuous, single phase at temperatures as low as -20° C. It also has a viscosity of no more than 2000 cps at temperatures as low as 0° C.

**Composition Comprising Alcohol Ethoxylate and Glucamide.** Aleksandra Sienkiewicz. Clariant International Ltd. European Pat. Appl. EP 3241887 A1, 8/11/17 Compositions comprising a) 5 to 50% by weight of one or more specific alcohol ethoxylates, b) 15 to 50% by weight of one or more specific N-methyl glucamides and c) 25 to 45% by weight of water are described. The compositions may be present, at a temperature of 20 °C, in the form of a gel or in the form of a paste, and furthermore e.g. in the form of a monodose product, and are suitable for cleaning, scenting or disinfection purposes, preferably in home or personal care applications. C<sub>16-18</sub> AE with 5-25 moles EO preferred.

**Sulfate-Free Personal Care Compositions and Methods for Using such Compositions.** Monique Adamy, Françoise Martine, Jennifer Cazette. Rhodia Operations. WIPO Pat. Appl. WO/2017/140798 A1, 8/24/17. The present invention relates to sulfate-free aqueous personal care composition comprising a surfactant system comprising at least one methyl oleoyl taurate, one isethionate and one alkoxyated sulfosuccinate, and from about 0.2-15 parts by weight of a conditioning agent. It is also directed toward the use of such a composition for washing keratin substrates, in particular the hair or the scalp.

**Stabilization of Protease in Cleaning Agents Containing Alkylbenzene Sulphonate.**

Detlef Buisker, Timothy O'Connell, Daniela Herbst, Marianne Schmeling. Henkel AG & CO. KGAA. WIPO Pat. Appl. WO 2017/144623 A1, 8/31/17. The invention relates to the use of sodium formate, sodium sulphate, low aliphatic alcohols or boric acid and of esters or salts thereof in order to stabilize a protease in a cleaning agent containing at least one compound from the class of compounds of the formula  $R-SO_3^-Y^+$  (I), as defined herein. The invention further relates to a cleaning agent containing at least one compound of the formula (I), as defined herein, at least one protease, and at least one of the aforementioned compounds, which act as protease stabilizers.

**Liquid Laundry Detergent Compositions.**

Julie Bennett, John Robert Carswell, Eva-Maria Reis-Walther, Christopher David Thorley, Gert Juergen Tropsch, Michael Holger Tuerk. Unilever PLC, Unilever N.V., and Conopco, Inc. WIPO Pat. Appl. WO 2017/198438 A1, 11/23/17. A liquid laundry composition comprising: (i) one or more anionic surfactants; and (ii) a non-ionic ethoxylated  $C_{10}$  Guerbet alcohol surfactant with a degree of ethoxylation in the range of 1 to 10; wherein the total amount of anionic surfactant in the composition is in the range of 3 to 18 wt% of the total composition and the weight ratio of the total amount of anionic surfactant to the non-ionic ethoxylated  $C_{10}$  Guerbet alcohol surfactant is in the range of 6:1 to 60:1. Use of a liquid laundry detergent composition including said non-ionic ethoxylated  $C_{10}$  Guerbet alcohol surfactant for laundering textiles wherein effective foam is maintained during a main wash step and an easy rinse of the textiles is provided during a rinse step. WO/2017/198574 A1 is similar with anionic surfactant 15-25% and anionic:AE is 6:1 to 100:1.

**Preparation of Surfactants via Cross-Metathesis.**

Adam M. Johns, Richard L. Pederson, Rosemary Conrad Kiser. Materia, Inc. U.S. Pat. 9758445 B2, 9/12/17. The present invention relates to compositions comprising alkene benzenes or alkene benzene sulfonates or alkylbenzenes or alkylbenzene sulfonates; methods for making alkene benzenes or alkene benzene sulfonates or alkylbenzenes or alkylbenzene sulfonates; where the benzene ring is optionally substituted with one or more groups designated  $R^*$ , where  $R^*$  is defined herein. More particularly, the present invention relates to compositions comprising 2-phenyl linear alkene benzenes or 2-phenyl linear alkene benzene sulfonates or 2-phenyl linear alkylbenzenes or 2-phenyl linear alkylbenzene sulfonates; methods for making 2-phenyl alkene benzenes or 2-phenyl alkene benzene sulfonates or 2-phenyl alkylbenzenes or 2-phenyl alkylbenzene sulfonates; where the benzene ring is optionally substituted with one or more groups designated  $R^*$ , where  $R^*$  is defined herein. This invention also relates to compositions, methods of making, use of, and articles of manufacture comprising 2-ethoxylated hydroxymethylphenyl linear alkyl benzenes. This invention also relates to compositions, methods of making, use of, and articles of manufacture comprising 2-propoxylated hydroxymethylphenyl linear alkylbenzenes.

## FEATURE: DOW CHEMICAL COMPANY PROFILE

### CORPORATE OVERVIEW

In 2015, Dow Chemical Company was the third-largest chemical company in the world, providing products for food, transportation, health, medicine, personal care and construction. Dow's revenue that year was \$49 billion, and they were operating in 180 countries and employing around 52,000 people. Dow's participation in the surfactant business is primarily attributed to the 2001 acquisition of Union Carbide, which also greatly enlarged Dow's position in ethylene oxide and derivatives, including alkylphenol ethoxylates and other surfactants. Dow is currently the world's largest producer of purified ethylene oxide, as well as propylene oxide.

Dow has been referred to as a "chemical companies' chemical company", in the sense that a majority of its sales are not to the end-users. In previous years, the company had a line of consumer products, however, they have since focused on selling higher value specialty chemicals today. The company employs a "market facing" approach, providing multiple products and services to customers through a direct marketing effort. Dow's consistent strategic approach has been to invest in a market-driven portfolio of advantaged and technology-enabled businesses that create value for its shareholders and customers.

Dow maintains an "asset light" approach for chemicals, a strategy that emphasized creative alliances to serve markets and customers, and reduces the importance of owning facilities to produce products and feedstocks. Dow's investment in both new and existing assets – and the product mix flexibility it derives from those assets – is based on market demands. The company has established several forward-thinking toll positions.

In Dow's Industrial Solutions business, for example, its previous alignment to technology centers (Polyglycols, Surfactants & Fluids, Amines and Chelants, Oxygenated Solvents, etc.) has been re-oriented to focus on key markets where its additive technologies and rich technical expertise can best advantage our customers in the markets where they thrive. Dow enables manufacturing through faster, better and cleaner solutions.

Regarding NPE use and regulations, Dow develops and maintains a broad portfolio of surfactants recommended as cost-effective alternatives to APE-based products in household cleaning and consumer care formulations – meeting many environmental standards globally. Dow will not support the use of APE-based surfactants for consumer cleaning products in regions where regulatory agencies have recommended against their use. The company has registered DOWFAX™ 2A1 with REACH in Europe.

In the past few years, Dow has made some major investments in new assets, while pulling back from some other investments. The company is currently constructing a large scale ethylene cracker on the U.S. Gulf Coast and has started a new 750,000 ton propylene dehydrogenation production facility in Texas. In Saudi Arabia, Dow is participating in the Sadara Cracker project through a joint venture. In Kuwait, Dow has restructured its equity in a joint venture MEGlobal, which makes ethylene glycol and diethylene glycol, through divesting its shares to EQUATE Petrochemical Company, K.S.C. for \$1.5 billion. Through its ownership interest in EQUATE, Dow retains a 42.5 percent share in MEGlobal. Also in 2015, Dow increased its share of the Dow Corning Corporation to 100 percent, while still maintaining a relationship with Corning through another joint venture. The company has announced plans to further divest \$7 to \$8.5 billion in non-strategic assets by mid-2016.

### Corporate organization

Dow's worldwide operations are managed through global businesses which are reported in five operating segments: Agricultural Sciences, Consumer Solutions, Infrastructure Solutions, Performance Materials & Chemicals and Performance Plastics. This operating structure maximizes Dow's integration benefits and the value from materials, polymers, chemicals and biological sciences to help address many of the world's most challenging problems – either through molecular and value chain alignment, or through the benefits derived from Dow's enhanced, innovation-driven market focus.

### Merger with DuPont

Dow and E. I. duPont de Nemours and Co. (DuPont) announced in December 2015 that they are planning an all-stock merger of equals to form a new company named DowDuPont. The market capitalization of both companies is estimated at \$130 billion and the merger is expected to be completed in the second half of 2016. Dow and DuPont shareholders will each own about half of the new company. Some 18 to 24 months after the merger, the resulting company is expected to split into three publicly traded companies: an Agriculture company, a Material Science company and a Specialty Products company. The new Material Science company, which will include surfactants, will be created from Dow's Performance Plastics, Performance Materials and Chemicals and Infrastructure Solutions segments, most of Dow's Consumer Solutions segment, as well as DuPont's Performance Materials segment. Together, the segments that will make up the Material Science company had a \$51 billion dollar in revenue in 2014.

Dow and DuPont estimate that the deal will help cut costs by \$3 billion within the first two years after the transaction closes. Some savings will be achieved by reducing the workforce. Dow plans on cutting 2,200 out of the about 50,000 jobs worldwide. DuPont plans to let go about ten percent of its 52,000 employees, including 1,700 at its Wilmington, DE headquarters. Dow's Chairman and CEO, Andrew Liveris, will become Chairman of DowDuPont, while DuPont's Chair and CEO, Edward Breen, will become CEO of DowDuPont. DowDuPont will be dually headquartered in Midland, MI and Wilmington, DE.

The merger remains subject to shareholder and regulatory approvals. Several organizations like Keep Your Promises DuPont and the National Farmers Union have already voiced opposition to the merger due to antitrust concerns. Before the planned split, DowDuPont would be the largest chemical company in the world, surpassing BASF. Even after the split, the largest agricultural chemical company in the world would be created with combined revenue of \$19 billion. DuPont's Performance Chemicals segment, including Capstone® fluorosurfactants, was spun-off as The Chemours Company in 2015.

In March 2016, BASF launched a counter offer for the DuPont business, however this merger seems unlikely to proceed.

### SURFACTANT BUSINESS

Dow's participation in the merchant surfactant business was limited prior to the acquisition of Union Carbide in 2000, which catapulted Dow into the position of a major producer, with surfactant production facilities are primarily located in the U.S., with ethoxylation plants at Terneuzen, The Netherlands, and Tarragona, Spain.

The Union Carbide acquisition also gave Dow a stake in the Optimal Group of Companies, a joint venture ethylene, ethylene oxide, ethylene glycol and ethoxylates project with Petronas. The complex in Kerteh, Malaysia started up in 2002, with Dow owning a 23.5 percent interest in Optimal Olefins, and a 50 percent interest in two other component companies, Optimal Glycols and Optimal Chemicals. The latter company manufactures EO derivatives other than ethylene glycol, including nonylphenol and octylphenol ethoxylates, polyethylene glycols and others. Dow divested its shares in this JV in early 2009. A commercial supply agreement with Petronas was subsequently put in place where Dow continued to serve most of its customers in the Asia/Pacific region with products manufactured by Optimal, however this has since ended.

Dow is committed to focusing its resources on businesses that are positioned for long-term growth and value creation within Dow. Dow's surfactants business is strengthened by being part of one of the world's leading chemical companies, in terms of the funding available for R&D, capital investment, and internal systems that enhance efficiency, productivity and the customer interface.

### Surfactant Products

Dow offers a range of mainly nonionic, and some anionic surfactants. These products and their major application areas are discussed below.

**DOWFAX™** - These alkyl diphenyl oxide disulfonates are currently co-produced for Dow at Pilot Chemical. It would appear that Pilot's "cold sulfonation" process is well suited to these reactions. The largest application for DOWFAX™ is for emulsion polymerization. Sales surged for a period in the 1980s with their adoption in autodish liquids. Other markets include cleaners compounds, textile processing, pulp & paper, oilfield, ag chemicals and some miscellaneous end uses.

A series of DOWFAX™ nonionic surfactants are produced in Europe, which in some cases are either EO/PO or EP/BO alcohols. Another series is proprietary which finds use in defoaming and anti-foam applications.

**TERGITOL™** - The TERGITOL™ series were the original surfactant line of Union Carbide, which Dow acquired in 2000. The largest-volume TERGITOL™ surfactants are nonylphenol ethoxylates. Other TERGITOL™ products include secondary alcohol ethoxylates and EO-PO copolymers, as well as the TERGITOL™ Minfoam low-foam alcohol alkoxyates. The TERGITOL™ surfactants are used in a wide range of industrial applications such as paints & coatings, textile processing, metalworking fluids, agrochemicals, and many others, as well as in industrial and institutional (I&I) cleaners. The primary alcohol ethoxylate business was sold to American Hoechst (now part of Clariant) in the early 1990s.

**TRITON™** - The TRITON™ products were acquired by Union Carbide from Rohm and Haas in 1990. They comprise a range of mainly nonionic and some anionic surfactants. Nonionics include octylphenol ethoxylates, alkylpolyglucosides, low-foam alcohol alkoxyates, and specialty alkoxyates. Anionics include phosphate esters, sulfosuccinates, and a few specialty sulfates and sulfonates. TRITON™ surfactants find use in many of the same industrial and I&I applications as the TERGITOL™ surfactants, as well as in other industrial and I&I end uses, and some are also used in household cleaners and personal care products.

**ECOSURF™** - These products were introduced in early 2009 as a nonionic APE-free line of surfactants based on a C<sub>6-10</sub> alcohol that is extended into the detergent range via block alkoxylation with propylene oxide or butylene oxide. This "hydrophobe extension" offers surfactants with certain performance advantages, although block alkoxylation decreases biodegradation rates, requiring careful balancing of the degree of hydrophobe extension with increased performance. The ECOSURF™ EH line consists of three products with varying degrees of PO and EO content. Because the PO is considered to be part of the hydrophobe, they are thought of as alcohol ethoxylates. The ECOSURF™ EH products are touted as offering excellent wetting and very low aquatic toxicity. They address the need for an effective, biodegradable alternative to alkylphenol ethoxylates. They are designed for use in hard surface cleaning, paints and coatings, textile processing, pulp & paper, and silicone emulsifiers. The ECOSURF™ SA line consists of four products based on short chain oleo alcohols. They are said to offer excellent wetting, rinseability and detergency, as well as other desirable properties for applications such as paints & coatings, household and I&I cleaners, and textiles.

### Surfactant Marketing

Dow Chemical employs a market facing organization which focuses on providing solutions to customers across key industries, for example, paint & coatings, oil & gas (oilfield chemicals), automotive, and home and personal care. The organization markets a variety of chemicals to each industry with surfactants included. For example, the Coating Materials segment offers acrylics, liquid and epoxy resins, oxygenated solvents, rheology modifiers, epoxy tougheners, opaque polymers, curing agents and intermediates, and dispersants, as well as surfactants. Dow is essentially a "one-stop shop" for industrial workhorse surfactants, specialty surfactants, and many other essential raw materials, offering the convenience and efficiency of multi-product sourcing to enhance customer relationships.

As needed, Dow will increase production to satisfy demand. For example, ECOSURF™ EH is now produced locally in Europe. This is a response to regional market-based needs for a robust APE alternative that may meet the ready biodegradable standard, features low aquatic toxicity and demonstrates an excellent performance profile.

Organizationally, Dow's surfactants business resides in a subgroup of the Performance Products operating segment that encompasses Performance Fluids, Polyglycols and Surfactants. Dow has split its marketing staff into two groups: one group is dedicated to markets and planning, with some taking responsibility for near-term planning, and others looking at the three to five-year timeframe, another group is responsible for physical assets, supply chain issues, and quality control.

**APE Replacements** - As a major producer of nonylphenol ethoxylates, Dow is keenly aware of the negative perceptions of these products because of environmental issues, but Dow is convinced that they will continue to be used because of their superior cost effectiveness, and Dow remains committed to supplying APE. Dow has developed a product portfolio of “green” surfactant products that can replace APE without sacrificing performance, and that are cost-competitive with other surfactant suppliers’ APE replacement products:

- ECOSURF™ EH Series - Specialty Ethoxylated Surfactants
- ECOSURF™ SA Series - Specialty Ethoxylated Surfactants
- TERGITOL™ 15-S Series - Secondary Alcohol Ethoxylates
- TERGITOL™ TMN Series - Branched Secondary Alcohol Ethoxylates
- TRITON™ CG Series - Alkyl Polyglucoside Surfactants
- TERGITOL™ L Series - EO/PO Copolymers
- TRITON™ DF Series, TERGITOL™ MinFoams - Low Foam Surfactants

#### **SURFACTANT-RELATED PLANTS AND CAPACITIES**

Dow’s surfactant production facilities include one large and two smaller ethoxylation plants in the United States, and ethoxylation facilities in Terneuzen, the Netherlands, and Tarragona, Spain. In the U.S., Dow’s main ethoxylation unit is in Hahnville (Taft), LA.

The company also has an alkoxylation unit of undisclosed size at its Freeport, TX site that produces EO-PO copolymers, secondary alcohol ethoxylates, and other specialty surfactants. A former Union Carbide ethoxylation plant in South Charleston, WV with an estimated capacity of [REDACTED] tons/year has been partly phased out of operation, but some small, niche APE products continue to be produced there, as well as ECOSURF™ products.

In Terneuzen, The Netherlands, Dow is a major producer of EO and most of the output is used to make polyurethane polyols. Dow also has [REDACTED] tons/year of ethoxylation capacity dedicated to the production of EO-PO copolymers and other surfactants. Propylene oxide for the Terneuzen operations is sourced from a hydrogen peroxide-to-propylene oxide (HPPO) plant in Antwerp, Belgium that is a JV of Dow and BASF.

In Tarragona, Spain, Dow has a multi-purpose plant that can be used to make up to [REDACTED] tons/year of surfactants. Dow also has a co-producer arrangement to toll surfactants in Europe, including APG for instance. Dow is a major producer of ethylene and ethylene oxide in the U.S., Canada, and Europe, with the majority of the EO output being used captively for the production of ethylene glycol and other non-surfactant derivatives, as well as serving the merchant EO market. However, large quantities of purified EO (PEO) are also used for the captive production of surfactant ethoxylates and alkoxylation. Dow has converted some of its EO-EG capacity to the production of PEO only, due to global EG market conditions, as well as reducing the need to buy PEO from the merchant market. The Terneuzen EO-EG plant was converted to produce PEO exclusively at the beginning of 2009, resulting in a [REDACTED] percent increase in PEO capacity to its current level of [REDACTED] tons/year. Maschem, a new ethoxylation unit owned by ICOF/MusimMas, is located at the Terneuzen site and started up during the first quarter of 2016. Maschem sources its EO supply from Dow.

In early 2010, Dow permanently closed the EO-EG plant at Wilton in the UK, following the closure of SABIC’s ethylene cracker. The plant had supplied EO to Croda (and Shell) for the production of ethoxylated surfactants, and with the Dow closure, Croda closed the ethoxylation unit at Wilton.

The following table details Dow’s surfactant and intermediate plants.

<b>DOW INTERMEDIATE AND SURFACTANT PLANTS, 2015 (thousand tons)</b>			
Plant Location	Process/Feedstock	Products	Capacity
<b>NORTH AMERICA</b>			
United States			
South Charleston, WV	Ethoxylation	specialties	■
	Sulfonation & Sulfation	sulfates, sulfonates	n.a.
Freeport, TX	Ethoxylation	EO/PO block polymers, AE, specialties	■
Seadrift, TX	UCC / Ethylene	EO	■
Plaquemine, LA	Dow / Ethylene	EO/EG	■
	Ethoxylation	PEG, surfactants	■
Taft, LA	UCC / Ethylene	EO	■
	Ethoxylation	NPE, PEG	■
Canada			
Prentiss I & II, Alberta (MEGlobal)	UCC / Ethylene	EO/EG	■
Fort Saskatchewan, Alberta (MEGlobal)	Ethylene	EO/EG	■
<b>WEST EUROPE</b>			
The Netherlands			
Terneuzen	SD* / Ethylene	EO	■
	Alkoxylation	EO/PO block polymers, AE, other	■
Spain			
Tarragona	Ethoxylation	nonionic surfactants	■
<b>MIDDLE EAST</b>			
Kuwait			
Al Shuaiba (Equate)	Dow METEOR™ / Ethylene	EO/EG	■
Al Shuaiba (Kuwait Olefins)	Dow METEOR™ / Ethylene	EO/EG	■
Saudi Arabia			
Sadara (Dow/Saudi Aramco)	Dow / Ethylene	EO/EG	■
*- Scientific Design			

## **STRATEGIC CONSIDERATIONS FOR DOW'S SURFACTANT BUSINESS**

Dow brings tremendous resources in the supply of EO and PO to its surfactant position. Historically, there were times when the Union Carbide organization sought a detergent alcohols plant and investigated the potential to utilize their own Oxo technology to produce the hydrophobe, which would put them on a competitive footing with fully integrated surfactant producers. For various reasons, this never materialized and the organization did not opt to compete in this side of commodity ethoxylates. Instead, performance and specialty surfactants won out as the definition of the surfactant position. And the role of the alkylphenol ethoxylates filled both the commodity and specialty side of the operation. As a result, Dow continued to produce large volumes of the APE and specialties like low-mol secondary alcohol ethoxylates. Over time, Dow has expanded its surfactant line to utilize its 2-EH output in the APE-replacement ECOSURF™.

Europe is an important market for Dow and the company has found a cost-effective way to supply it without a major investment in production facilities. The lack of alcohol production in the region is less problematic because Dow is exclusively selling specialty surfactants on the basis of performance, rather than cost. Dow has ample EO and PO available for captive production and to supply toll manufacturing, which gives it a different, but effective type of integration.

By focusing on APE to more technical end-uses, Dow has been well positioned for the shift away from APE use in household. In terms of end markets, Dow is well established in the I&I, household and industrial sector. Through the strength of its chemical portfolio, the Dow relationships are strong in the household sector. Weighing against ongoing pressure to reduce the formulation costs of household cleaners is pressure to make products more environmentally acceptable. Thus success in this sector is attainable for those suppliers that can bring demonstrable product benefits to the marketplace through scientific breakthroughs that address both cost and environmental issues.

With its technical strengths and experience in cleaning compounds, Dow has a solid position in the I&I cleaners market. In the industrial sector, Dow continues to be very strong in its core areas of chemicals for paint & coatings and emulsion polymerization. Other significant end use areas for Dow, such as pulp & paper and textiles, are no longer vibrant sectors in North America. However, Dow Agrosience, which includes both pesticides and adjuvants, has been a captive outlet for surfactants.

The new DowDuPont will be able to couple enzymes with polymers and surfactant sales; a kind of trifecta in positioning for consumer and other products.

## FEATURE: CENTRAL & WEST EUROPE PROFILE

### INTRODUCTION

The countries in Europe have a population of 541 million or about eight percent of the global population. Consumption of primary surfactants in the region is 19 percent of global consumption. Additional information about global primary surfactant consumption by region is presented in the following table.

WORLD PRIMARY SURFACTANT CONSUMPTION IN ALL APPLICATIONS, 2009		
Region	Consumption (million tons)	Percent (%)
North America		
Latin America		
Central and West Europe		
Asia/Pacific		
Other Regions <sup>a</sup>		
TOTAL		

<sup>a</sup> East Europe, Africa, Turkey and the Middle East.

Europe for this profile consists of Central and West Europe. The countries of Central Europe were added to West Europe because as members of the EC, the ability to distinguish surfactant demand between the west and central areas has disappeared. The countries that are now included in Europe are:

MAJOR COUNTRIES IN CENTRAL AND WEST EUROPE	
Albania	Lithuania
Austria	Luxembourg
Belgium	Macedonia
Bosnia	Malta
Bulgaria	Montenegro
Croatia	Netherlands
Cyprus	Norway
Czech Republic	Poland
Denmark	Portugal
Estonia	Romania
Finland	Serbia
France	Slovakia
Germany	Slovenia
Greece	Spain
Hungary	Sweden
Ireland	Switzerland
Italy	United Kingdom
Latvia	

The economic environment of Europe has been slower to recover than other regions of the world. With both advanced and emerging countries in Europe, individual recovery by countries has varied considerably.

The European surfactant markets continue to be served by a few large integrated intermediate and surfactant producers and a number of smaller, regional surfactant suppliers. The large multinational detergent producers, like Unilever, Henkel, and Procter & Gamble, are major customers for intermediates and surfactants and, in some cases, utilize toll production for some surfactants. Most of the large detergent manufacturers have sulfation/sulfonation plants but none have ethoxylation facilities and must purchase ethoxylates, often for additional processing. Smaller, regional detergent producers tend to purchase more surfactants than intermediates. Only a few personal care producers manufacture the surfactants utilized in their products and most are surfactant customers. Formulators and blenders are important surfactant customers as they offer both formulation and services to end users in specific application areas. Industrial users of surfactants purchase surfactants in many forms: as complete formulations (mainly in textiles, pulp and paper and agricultural uses), as partial blends that are finished by the end user, or the purchase of individual surfactants that are blended by the end user to provide the desired performance.

Large merchant surfactant producers like AkzoNobel, BASF, Clariant, Cognis, Huntsman and Sasol typically provide a wide range of commodity and performance surfactants not only to the European operations of the major customers but to their international operations as well. Other companies like Rhodia, Evonik (Degussa/Goldschmidt), Shell and Croda have concentrated on niche areas and are a different breed of surfactant supplier.

REACH (Registration, Evaluation and Authorisation of Chemicals), a European Union regulation that replaces a number of European Directives and Regulations with a single system, has its registration deadlines approaching in November 2010. REACH required all the manufacturers and importers of chemicals to pre-register them with the new European Chemical Agency (ECHA) at the end of 2008. Full registration starts on November 30, 2010 with those products manufactured or imported at 1,000 tons/year or more. Smaller volumes of chemicals need to be registered in stages up to 2018. REACH has the potential to exclude manufacturers and importers from the intermediate and surfactant markets. If companies do not register, or if they cannot demonstrate that their substance can be used in a way that controls risk to workers, consumers and the environment, then the

manufacturer cannot supply the chemicals intended for that use. The ECHA is currently offering assistance to companies which have found themselves in difficulty submitting a full registration dossier for the legislation.

## **SURFACTANT SUPPLIERS**

The European surfactant market is supplied by multinational and a number of many medium sized and smaller privately held companies supplying a regional or speciality niche market. The production of primary surfactants – sulfates, sulfonates, ethoxylates and ethoxysulfates – account for over 50 percent of the total surfactants consumed. The larger surfactant producers have ethoxylation and/or sulfation/sulfonation capacity.

After months of rumors and a contest to win Cognis, the owners announced in June 2010 their intentions to sell its shares to BASF. BASF has reached the agreement with Cognis Holding Luxembourg S.à r.l. – which is controlled by Permira Funds, GS Capital Partners and SV Life Sciences – to acquire the specialty chemicals company for an equity purchase price of €700 million. Including net financial debt and pension obligations, the enterprise value of the transaction is €3.1 billion. The acquisition is subject to clearance by the competent merger control authorities. Closing of the transaction is expected for November 2010 at the latest. Cognis was an integrated part of Henkel, the German consumer products company until 1999, when it became an operationally independent business unit. In November 2001, Cognis was bought by private equity funds Permira, GS Capital Partners and SV Life Sciences. In 2008, Cognis recorded sales of about €3 billion and an Adjusted EBITDA (operating result) of €351 million.

The Cognis/BASF event is the “mega-event” of three key events taking place in Europe in 2010. The other two are the closure of ethoxylation at Wilton, UK and the planned start of Hansa’s new sulfonation/sulfation unit at Genthin, Germany in November. The effect of the closure of Wilton’s reactors early in the year has been mitigated by the shift of production to the other locations on the continent. The start-up of the Hansa unit later this year will likely have a negative effect on smaller anionic producers that will have difficult competing with the new, large-scale unit.

## **Sulfators/Sulfonators**

The large number of sulfators/sulfonators in Europe is a vestige of pre-EC Europe and the result of the practice of maintaining local operations on account of restrictive tariffs which prevented the free movement of goods. As the EU evolved, these tariffs were eliminated resulting in the consolidation of sulfation/sulfonation plants by a few multi-national surfactant producers and the rationalization of smaller plants. However, this process is largely complete and leaves a tiered structure of large, pan-European suppliers, regional players and a few local operators.

Central and West Europe experienced an increase in sulfation/sulfonation capacity from [redacted] tons in 2008 to [redacted] tons in 2009, an increase of [redacted] tons. New plants include Kapachim Greece’s [redacted] tons per year plant in Inofita, Greece and Zschimmer & Schwartz Italiana [redacted] tons per year plant in Tricerro, Italy. Balkin Progetti Management’s plant in Sofia, Bulgaria was identified to have an annual capacity of [redacted] tons.

German-based Hansa Group AG, and its affiliate Chemische Fabrik WIBARCO GmbH, have started work on a new sulfonation plant in Genthin, Germany. The new [redacted] ton unit will make LABS, AES, and AE, with production capacity slated 50 percent towards LABS, and 25 percent towards each of the alcohol-based surfactants. The plant uses Chemithon technology with two falling-film reactors. Earlier, Hansa acquired the site which contains detergent production from Henkel.

When Pulcra was sold by Cognis, a [redacted] ton, two-unit sulfonation/sulfation plant became part of Fashion Chemicals. The operation is located in Barcelona, Spain. The products made at this location include LABS, AES, AS as well as a range of other chemicals.

Sasol Olefins & Surfactants has reportedly stopped the production of secondary alkane sulfonates (SAS), also referred to as paraffin sulfonates, in June 2010. The company operated a [redacted] ton/year operation in Marl, Germany, using the sulfoxidation process. West Europe is currently the only region that SAS is produced, and the remaining companies that have capacity include Clariant, Lanxess and Leuna Tenside. The end-uses for SAS include: detergents and cleaning compositions, hand cleaners, textile and leather auxiliaries, crop-protection compositions, metal processing, and emulsion polymerization.

The leading merchant sulfators/sulfonators in Europe are shown in the following table along with their main products.

**EUROPE - LEADING MERCHANT SULFATORS/SULFONATORS, PRODUCTS AND CAPACITIES, 2010<sup>a</sup> (thousand tons)**

Company	Product	Capacity
Sasol Olefins & Surfactants		
Cognis		
Huntsman		
Stepan		
CEPSA - San Roque		
IFraChimie		
Clariant		
Unger Fabrikker A.S.		
Kao		
PCC Rokita SA		
ISU		
Kapachim Greece		
Zschimmer & Schwarz GmbH		
Hansa Group		
Ital Silva		
Fashion Chemicals		
Tensichem		
Verila		
Balkan Progetti Management		
Leuna-Tenside GmbH		
Lanxess AG		
Chimcoplect		
Benckiser (Mira Lanza SpA)		
Alapis Group		
Other Merchant		
TOTAL		

<sup>a</sup> Excludes producers of petroleum sulfonates, naphthalene sulfonates and hydrotropes and captive detergent producers.

<sup>b</sup> New [redacted] ton plant expected in Q4 2010

**Ethoxylators**

European ethoxylators are 32 in number versus 42 to merchant sulfators/sulfonators. The large number of producers is also a vestige of multi-European countries that have now merged to form the EC. With the establishment of the EU and the elimination of tariff barriers, other factors have risen in importance like the availability of EO and the logistics of safely transporting EO to plant sites. Consolidation and rationalization continue as witnessed by the closure of UK ethoxylation earlier this year and now by the acquisition of Cognis.

The top five ethoxylators accounted for over 49 percent of the European ethoxylation capacity. Sasol has been the largest ethoxylator and has two ethoxylation sites along with an amount of captive EO and higher alcohols. Cognis, the second largest ethoxylator with seven manufacturing plants, is not integrated into captive EO production but does have a large captive supply of detergent alcohols. The combination with BASF later this year will push Cognis ahead of Sasol in this category and in EO and alcohols as well. Ineos Oxide has reportedly expanded its ethoxylation capacity in Antwerp, Belgium by [redacted] tons, bringing its total capacity to [redacted] tons. Clariant and Huntsman are the next two largest ethoxylators. Clariant maintains two sites with captive EO at one plant while Huntsman has two sites and is not integrated.

As a result of the closing of Dow's ethylene oxide plant in the UK in January 2010, Croda International and Shell have shuttered their downstream ethoxylation plants in Wilton with allocated capacities of 40,000 tons per year and 130,000 tons, respectively. This move was the only realistic response to the loss of the only domestic producer of EO in the UK. Although significant efforts had been undertaken to keep the plant operating by placing it under new ownership or other arrangements, no adequate agreements could revive the EO-related components of the site. Since the closures of the plants in the UK, Croda has expanded its capacity in France by an estimated [redacted] tons and Shell has created a tolling agreement with Dr. Kolb.

Dr. Kolb (Kuala Lumpur Kepong, KLK) brought on new capacity in 2008 of [redacted] tons at its plant in Moerdijk, The Netherlands increasing the total company capacity to [redacted] tons per year. Wall Chemie on the German/Belgium border has been identified. The plant operates an estimated [redacted] tons of ethoxylation capacity.

It will be interesting to see what integration measures are taken with the acquisition of Cognis by BASF. Cognis is one of the leading ethoxylators in Europe and currently sources much of its EO from Ineos. BASF, which has its own captive EO, could potentially supply the EO for the Cognis ethoxylation operations although it prefers not to make shipments of the material. Thus, on the one hand, the Dormagen Site in Köln (Worringen) looks to make long term sense with proximity to Cognis alcohols and Ineos EO. It would appear that the other locations also make sense from the standpoint of serving more distant customers. Although no announcement of an integration plan has been made, an opportunity exists for some adjustment to this supply chain in the future.

The following is a list of the leading Europe ethoxylators and capacities for 2010.

<b>EUROPE - LEADING ETHOXYLATORS AND CAPACITIES, 2010 (thousand tons)</b>	
Producer	Capacity
Sasol Olefins and Surfactants	
Cognis	
BASF	
Ineos Oxide	
Clariant	
Dr. Kolb (KLK)	
Huntsman	
Seppic	
Akzo-Nobel	
Croda International	
Evonik	
IQA	
Lamberti Group	
Dow	
Baker Hughes	
Rhodia Geronazzo	
Teol	
Wall Chemie	
Kao Corp.	
Elementis	
IFraChimie	
PCC Rokita SA	
Bozzette Industrie Chimiche SpA	
CECA S.A.	
PetroBrazi/Teleajen Combine	
Sabo	
Zschimmer & Schwarz GmbH	
Others	
TOTAL	

## **RAW MATERIALS**

Production of the key surfactant intermediates - detergent alcohol, linear alkylbenzene, ethylene oxide and is distributed widely across the region. Intermediate feedstock prices peaked in 2008 in response to petroleum and followed it down through early 2009. Since this fallout of prices seen during Q4 2008 through Q1 2009, each of the raw materials has progressed on an individual track, allowing intermediate producers to implement steady increases. For both alcohols and LAB, profitability has been recovered.

### **LAB**

The linear alkylbenzene market in Europe has not shown any significant changes over the past two years. Production levels by some producers have been scaled back over the past year due a reduction in demand caused by the global economic crisis.

In Germany, HANSA had a temporary shutdown due to an explosion at AkzoNobel's chlorine plant, the supplier for the LAB plant's catalyst. The four-week shutdown hindered the overall production output, but has since returned to optimal production levels. The plant has a nameplate capacity of [REDACTED] tons/year.

### **Detergent Alcohols**

European production has been hampered by the intense competition from Asian imports during the last three years. Smaller units have been compromised, stopped production or at least cut back. In August, Sasol and Cognis managed to get the EC to open an anti-dumping case against the exporting Asian countries.

### **Ethylene Oxide (EO)**

EO in Europe has been hampered by planned and unplanned outages through 2009 and 2010. The latest unplanned events affected Ineos and Shell in 2010. Competition from new Mid-Eastern capacity start-ups has been less severe than anticipated, thus there has yet to be any fallout amongst the European plants.

## **INTEGRATION**

The integration of primary surfactant producers is strong in Europe. The share of ethoxylators held by integrated producers stands at 69 percent today compared to 33 percent for sulfonation/sulfation. In nonionics, producers can be integrated on both sides of the molecule and with EO under pressure from rising world capacity, one sees EO producers looking for ways to reduce their exposure to ethylene glycol. Surfactants remain an important outlet for EO and further adventures into the field of ethoxylation could be expected over the next few years.

Different levels of integration with detergent alcohols and/or EO exist for nonionic producers today while the European LAB producers are nearly fully integrated. Sasol has the most sulfonation of the LAB producers with plants in Italy and Germany. Sasol also is the largest ethoxylator ahead of Cognis by about 35,000 tons. With the closure of alcohol capacity at Augusta in 2008, Sasol fell slightly behind Cognis in European capacity. While Sasol has some ethylene oxide, Cognis currently has none and has relied greatly on Ineos. The other differences between the market leaders include the significant synthetic alcohol position of Sasol, the LAB/LABS and the focus by Cognis on the personal care sector. As mentioned earlier, the BASF acquisition will benefit both companies. Adding BASF with Cognis, the combined entity jumps ahead with the additional EO, alcohol and ethoxylation of BASF.

In the anionics, after the two leaders, there are two large non-integrated producers: Huntsman and Stepan. Huntsman has some ethoxylation and focuses largely on the sulfates. Stepan produces a wider range of sulfates and sulfonates. After these non-integrated producers, the next largest sulfonator is CEPESA, with capacity in Spain. CEPESA is also working with Petrochemia in the eastern zone which is a less captive market for sulfonates than the west. ISU, the Korean LAB maker [REDACTED] tons of capacity) took over the Unilever reactor in Mannheim, Germany. The company also operates a small unit at Marseilles. Hansa, a small sulfonator/sulfator in Germany has bought the WIBARCO LAB business and is in the process of erecting a large new sulfonation capacity in Genthin.

In nonionics, on the second tier of capacity size has been BASF, Shell, Ineos and Clariant. Shell was closely matched in ethoxylation capacity to BASF, but has moved into a tolling agreement with Dr. Kolb (KLK). Shell needs to take some action to hold onto its position long-term. Otherwise it will be out of surfactants and have to play the field in intermediates. Shell has EO in Holland and alcohols are located in the UK. BASF has EO integrated at ethoxylation sites in Belgium and Germany. BASF has several types of synthetic alcohol production at Ludwigshafen and has been aggressively pursuing the industrial market where the use of alkylphenols is being eliminated. With BASF moving up, Clariant and Ineos remain at this level. Clariant and Ineos both have EO and were close followers to the leaders and will now lead the second tier in terms of ethoxylation capacity. Their approaches are really completely different. Clariant eschews commodities to focus on application technology as much as possible. Clariant, like BASF is an important supplier of block copolymers in Europe. Clariant is also

an important supplier to oilfield chemicals. A difference in the approaches of Clariant and Ineos to the market is that Ineos relies entirely on the toll production of ethoxylates for customers. Ineos is also the key merchant supplier of EO for surfactant makers in Europe.

While European producers have a considerable edge in surfactant feedstocks, no one expects large capacity increases to support exports. Rather, as Sasol has shown in 2007, the trend is to close European capacity in favor of offshore production. Cognis has exported to Asia for years and has recently completed a new APG plant in China.

**EUROPE - INTEGRATION OF LEADING MERCHANT SURFACTANT PRODUCERS, 2010**  
(thousand tons)

Company	C <sub>12+</sub> Alcohol	LAB	AP	EO	Sulfation/Sulfonation	Ethoxylation
Akzo-Nobel						
BASF						
Cognis						
CEPSA Quimica						
Clariant						
Dr. W. Kolb (KLK)						
Evonik						
Hansa Chemie						
Huntsman						
Kao						
IFraChimie						
Ineos Oxide						
ISU						
Sasol Olefins & Surfactants						
Seppic						
Shell Chemicals UK Ltd.						
Stepan						
Unger Fabrikker A.S.						
TOTAL LEADERS						
TOTAL EUROPE						
Leaders as a percentage of Total Europe						
NR = Non-regional <sup>a</sup> - Closed, January 2010						

## **STRATEGIC APPROACH**

### **BASF**

BASF places great importance on an integrated site structure, which it calls "Verbund." Its European Verbund sites are in Antwerp, Belgium and Ludwigshafen, Germany. These are the core of its European operations. Ludwigshafen has over 300 production units while the Antwerp site has about 54 units. The Verbund concept is based on the creating value by linking the production, production of co-products and waste products from one plant to other plants or directly to the merchant market. Ludwigshafen is integrated with production of ethylene, ethylene oxide, ethoxylation capacity (over [REDACTED] tons/year) and the production of higher alcohols (capacity near [REDACTED] tons/year, including plasticizer alcohols). Since 2001, the company's surfactant development activities have centered on the commercialization of 2-propyl heptanol-based ethoxylates as replacements for alkylphenol ethoxylates. It is the leading producer of plasticizer alcohols and offers a wide range of ethoxylated derivatives based on captive EO and alcohols made in its oxo alcohol plant in Ludwigshafen. The Antwerp site is also heavily integrated into the production of EO and ethoxylates and its derivatives. In June 2010, BASF announced plans to purchase Cognis.

### **CEPSA**

Grupo CEPSA (Compañía Española de Petróleos SA) is the 100 percent owner of CEPSA Química, S.A., formally Petresa. CEPSA manufactures n-paraffins, linear alkyl benzene and its derivatives. The European plant in San Roque, Spain is a leading LAB producer with [REDACTED] tons of capacity based on n-paraffin feedstock. It also has sulfonation capacity for [REDACTED] tons of LABS at the San Roque site. Its LAB is mainly sold to the merchant market for use in household detergents and to other sulfonators but it also sells some LABS and linear alkylbenzene sulfonic acid. It is a large efficient LAB producer and exports about half of its production from Europe. It has a partnership with Petrochema (LABS capacity [REDACTED] tons/year) in Dubová, Slovenia. It also has cooperative efforts with ISU Chemical in Germany to produce sulfonic acid earmarked for Central European markets.

### **Clariant**

Clariant's surfactants are part of the Detergents & Intermediates Business Unit that supplies products to the household, personal care. A reorganization in January 2010 to ten business units (from four) has separated several elements of the operation.

Clariant's ethylene oxide plant in Gendorf, Germany is integrated with an ethoxylation plant (capacity [REDACTED] tons/year). It produces a range of EO derivatives that includes tallow amines for agricultural applications, PEG's and EO/PO block polymers for personal care and other surfactants. A [REDACTED] ton/year ethoxylation plant in Tarragona, Spain is mainly focused on producing surfactants for the local household/industrial market. Clariant has sulfonation capacity in Cruise-Lamotte, France ([REDACTED] tons/year) and in Wiesbaden, Germany ([REDACTED] tons/year). These plants produce paraffin sulfonates (SAS). Another major producer of SAS, Sasol, has recently exited the business leaving Clariant as the sole supplier of this material for use in detergents. Clariant produces a wide range of anionic, nonionic, cationic, and amphoteric surfactants as well as bleach activators.

### **Cognis**

Cognis was spun off as an independent company from Henkel in 2001 and was taken private by the equity funds Permira, Goldman Sachs Capital Partners and SV Life Sciences. The original plan was to double the business and then take the company public in four or five years. In 2007, this divestiture plan for Cognis was abandoned after failing to uncover adequate offers for the business. It was felt that it was in the best interest of the stockholders to keep the company as the growth potential was greater than originally projected. Meanwhile Cognis worked on problem segments. During this period, the oleochemicals business was put into a joint venture with Sime Darby (formerly Golden Hope Plantations). Then Cognis sold off their remaining share and the venture was re-christened Emery Oleochemicals.

Cognis is back integrated into fatty alcohols with European plants located in Düsseldorf, Germany and BousSENS, France. Its anionic focus is on AES and AS while the nonionics are mainly AE and block polymers. Cognis is the second largest ethoxylator in Europe with two plants in France (total capacity [REDACTED] tons/year), Germany (in Düsseldorf and Worringer - a total capacity of [REDACTED] tons/year), Italy ([REDACTED] tons/year) and Spain (total capacity [REDACTED] tons/year). Cognis is also the second largest merchant sulfator/sulfonator in Europe with a total capacity of [REDACTED] tons/year with plants in Meaux, France (capacity [REDACTED] tons/year), Düsseldorf, Germany ([REDACTED] tons/year), Italy ([REDACTED] tons/year) and in Spain (capacity [REDACTED] tons/year). In November 2008, Pulcra, a former subsidiary, was sold and a two-unit, [REDACTED] ton sulfonation unit in Barcelona, Spain became a part of Fashion Chemicals. Cognis is known to be exporting products from these plants to support activities in other parts of the world.

Cognis is focused on supplying surfactants to the personal care, household and specific industrial applications like textiles, oilfield, leather, ag chemicals, coatings and plastics. Cognis is the largest APG producer in Europe and recently opened a new APG plant in China. Cognis is also an important supplier to the European betaine market.

### **Croda**

Croda purchased Uniqema's oleochemical and surfactant business from ICI in 2006. Prior to the acquisition, Croda had been shifting away from industrial chemicals to focus on the higher margin consumer markets. Its oleochemicals were used in lubricants and specialty coatings as well as in personal care products. Croda had ICI's Uniqema as a prime acquisition target for several years as this acquisition strengthens Croda's position in consumer care. Croda has since sold the ICI Uniqema oleochemicals site in Klang, Malaysia to KLK in 2007 and its U.S. oleochemical business to HIG Capital Miami in May 2008.

Croda's acquisition of Uniqema added a total of [redacted] tons/year of ethoxylation capacity ([redacted] tons/year in Wilton, UK, 40,000 tons/year in Choques, France and [redacted] tons/year in Mevisa, Barcelona, Spain) to Croda's [redacted] tons/year in the Rawcliffe Bridge, UK to reach a total capacity of [redacted] tons/year. Due to the closure of Dow's EO plant in the UK, Croda has been forced to close its 55,000 ton UK capacity. Croda has shifted the production to its other locations, primarily in France and expanded the Choques capacity by an estimated [redacted] tons. Croda's surfactants are mostly based on Uniqema's product line and include EO/PO block polymers, alkoxyated ethylene diamines, alkoxyated bisphenol A, EO/PO alcohols, fatty amines ethoxylates, castor oil ethoxylates, Spans<sup>R</sup>, Tweens<sup>R</sup>, natural and synthetic alcohol ethoxylates and a range of performance ethoxylates. Although Croda's surfactants are used in a number of industrial applications, its focus in the last few years has concentrated on the personal care and lubricant markets.

### **Dr. Kolb**

Dr. Kolb was an independent producer of paper chemicals and nonionic surfactants that was bought in 2006 by Kuala Lumpur Kepong Berhad (KLK) Malaysia. Dr. Kolb operates two European manufacturing plants, one in Hedingen, Switzerland with capacity for about [redacted] tons/year of specialty oleochemicals and a [redacted] ton/year alkoxyates plant in Moerdijk, The Netherlands. A third ethoxylation reactor installed at Moerdijk was installed in 2008. This increased the company's capacity to over [redacted] tons/year. Dr. Kolb is also engaged in the distribution and trading of specialty oleochemicals. The Netherlands site is connected by an EO pipeline to the nearby Shell ethylene plant. The plant concentrates on volume products which includes toll manufacturing of EO derivatives. The Hedingen site receives EO by truck and rail and has smaller reactors and concentrates on the production of specialty products, esters and other nonionic products. The acquisition of Dr. Kolb provided KLK an outlet for its fatty alcohols and fatty acids, two main raw materials purchased by Dr. Kolb. It also provided alkoxylation technology to KLK that could be use to expand downstream in the production of nonionic surfactants and esters at other locations. Since the closure of Shell's ethoxylation unit in the UK, the company has worked out a tolling agreement for ethoxylated products.

### **Huntsman**

Huntsman is a multinational producer and marketer of commodity and specialty products. Huntsman's European surfactants business was created in 2001 when it acquired the former Albright & Wilson European surfactant business from Rhodia. This business has been a difficult business for Huntsman to manage and with continuing losses, it had undergone reorganizations and plant closures and consolidations. Huntsman closed the alcohol, ethoxylation and sulfation plants in Whitehaven, UK, consolidated ethoxylation production in Italy by closing the Castiglione plant and moved the equipment to Patrica, Italy. Huntsman currently operates ethoxylation plants in France at Lavera and St. Mihiel (total capacity of [redacted] tons/year) and in Italy ([redacted] tons/year). It has sulfation/sulfonation plants in St. Mihiel, France ([redacted] tons/year), Italy at Castiglione and Patrica (total capacity [redacted] tons/year) and Barcelona, Spain ([redacted] tons/year). Huntsman's plants in Europe are mainly producing AS, AES and some LABS. It has strong position in AES and competes with Cognis and Stepan. It also produces some AE and APE. It also has sales in specialty products that include betaines, quats, amine oxides, sulfosuccinates, phosphate esters, imidazolines and ethoxylated amines.

Huntsman is competing in the household and personal care markets with a full range of anionic, nonionic and specialty surfactants.

### **IFraChimie**

IFraChem (as it was called) was formed when InChem holdings purchased the Witco sulfonate and ethoxylate business located in Elbeuf, France in 1998. The original owners incurred financial difficulties and in 2004 it passed through bankruptcy and emerged in 2006 under new owners as IFraChimie. It has a current ethoxylation capacity of [REDACTED] tons/year and sulfonation capacity of [REDACTED] tons/year. IFraChimie is known to do extensive tolling, producing AES, AOS, and LABS for several major European surfactant producers. It has recently been reported that the company has encountered financial troubles and entered in receivership, part of the bankruptcy process, on July 1, 2010. A decision on the next step is in the legal process is due by November 1, 2010.

### **PCC Rokita SA**

As of April 2010, Rokita is 100 percent owned by the German company PCC, SE which started acquiring the company in 2003. PCC SE based in Duisburg, Germany is global organization that engages in trade in chemical products, coal and electricity, chemical products, and logistics and transport. PCC Rokita SA is a group of companies based in Brzeg Dolny, Poland with manufacturing plants in Poland. It is based on four business units: Chlorine Business Unit, Polyols Business Unit, Surfactant Business Unit and Phosphorous Business Unit. PCC Rokita is not integrated into the production of EO but is on a pipeline and had a long term EO supply contract with PKN Orlen, which is reportedly now closed. It has recently been reported that the EO supply has been disrupted and the ethoxylation capacity is not operational. Current ethoxylation capacity is [REDACTED] tons/year in Brzeg Dolny, Poland but it had announced a new [REDACTED] tons/year plant to be under construction in Plock, Poland in late 2006. This plant has been delayed and is now reported to be in engineering and a completion date is not available at this time. Rokita's sulfonation plant in Brzeg Dolny was expanded in 2007 and is currently rated at [REDACTED] tons/year. The major markets for its surfactants are in detergents and personal care.

### **Sasol Olefins & Surfactants**

Sasol is the leading and best integrated intermediate and surfactant producer in Europe. Sasol's acquisition of RWE's chemical subsidiary CONDEA in 2001 provided the basis for the European surfactants business with plants in Germany and Italy. Its plants in Germany include Brunsbüttel for synthetic and oleo detergent alcohols with a total capacity of [REDACTED] tons of C<sub>12+</sub> alcohol. It has a special grade of synthetic alcohol tolled for them by Oxeno which took over many of the plant operations at the Marl site in the 1990s. In Marl, Sasol also produces alkylphenols, ethylene oxide, ethoxylates (capacity [REDACTED] tons/year), sulfonates and sulfates (combined capacity [REDACTED] tons/year). Sasol replaced its old Cascade sulfonation unit in Marl with a Ballestra plant with [REDACTED] tons/year capacity in 2007. Its plants in Italy produce LAB, normal paraffins, ethoxylated products (capacity [REDACTED] tons/year) and has sulfated/sulfonated surfactants (total capacity of [REDACTED] tons/year) as well. Operations in Central Europe include a [REDACTED] ton/year ethoxylation plant in Nováky, Slovakia. Although it has tried to branch out into other surfactants, its main markets in Europe are in LABS, AE, AES and APE. It has added other products like amines, amides, betaines and other materials to complement its primary surfactant position. In 2010, Sasol exited and closed a [REDACTED] ton reactor for the paraffin sulfonate (SAS) business. This leaves the [REDACTED] Ballestra unit and a [REDACTED] ton sulfate plant operating in Marl. Sasol is well integrated in surfactant production and has this region's second largest merchant ethoxylation capacity totaling [REDACTED] tons/year and the largest sulfation/sulfonation capacity totaling [REDACTED] tons/year.

In 2007, Sasol idled its European LAB plant in Porto Torres, Sardinia, reduced the normal paraffin operating capacity by closing 2 [REDACTED] tons of capacity in Italy, and with the start-up of its [REDACTED] tons/year of oleoalcohol capacity in China with its joint venture partner, Wilmar China Investments, idled [REDACTED] tons/year of oxo alcohol capacity in Augusta (about half of the plants total capacity).

## Shell

Shell is back integrated for the production of ethoxylates with the captive production of ethylene oxide capacity of [REDACTED] tons/year at Moerdijk, The Netherlands; capacity of [REDACTED] tons/year of synthetic detergent alcohol at Stanlow, UK. In January 2010, Shell was forced to close its [REDACTED] ton European ethoxylation operation at Wilton, UK, due to Dow closing their EO plant and cutting off a key raw material supply. Despite the closure, Shell has worked out a tolling agreement with Dr. Kolb (KLK) for ethoxylated products. Shell Chemical has indicated that it wants to be in the top tier of bulk chemical suppliers and has made investments in Moerdijk and Stanlow to improve manufacturing performance and to reduce expenses. Shell has closed an olefin-based LAB plant in South Africa in 2007 and the plant officially was dismantled in 2009.

## Stepan

Stepan is a producer of anionic and cationic surfactants. In 2000 to 2002, the company expanded its European base with acquisitions. In 2000, it acquired Manro Performance Products in Staleybridge, UK, which added [REDACTED] tons/year of sulfation/sulfonation capacity that produced LABS, AES, AS and other products. Fabric softener quat production was added in 2004 at this plant. Stepan acquired Pentagon's UK surfactants business in 2002 and added biocidal quats to its portfolio. Stepan had a small sulfation/sulfonation plant ([REDACTED] tons/year capacity) producing LABS and AES in Cologne, Germany and a multipurpose quats plant in Voreppe, France (about [REDACTED] tons/year capacity). Other surfactants manufactured in Europe are amine oxides, alkanolamides, betaines and sulfosuccinates. These and the above cited performance surfactants are seen as a growing segment in Stepan's business. It has, however, worked to expand its anionic business and has also diversified into special industrial accounts with performance surfactants.

## SURFACTANT CUSTOMERS

### Household

Heavy duty laundry detergents constitute the majority of the market for surfactants in household products. The largest detergent producer is Procter & Gamble with over a 30 percent value share. Other producers with closer to 20 percent share include Henkel and Unilever. In several areas, Reckitt-Benckiser holds an important share as Unilever does not participate evenly across the region.

Private labels are important in Europe, representing an average of 12 percent of the market value and a higher share of volume. Robert McBride from the UK is one of the leading private label suppliers. Hansa has bought the Genthin site of Henkel and will now produce detergents as well as LAB and anionic surfactants. Western Europe saw a slight expansion in the market for detergents and household cleaners during 2009. The economic slump caused uncertainty among consumers. This led to increased price sensitivity and, as a result, a rise in the market share of private labels and also an increase in the share of the market attributable to discounters. Not all producers responded quickly and at first Henkel gained share against rivals. Henkel achieved about three percent growth in household revenue in 2009. More recently, Procter & Gamble has been responding with lower prices to gain back share it lost.

The European detergent scene has been changing with a shift to liquids and declining wash temperatures. The tablet form has lost significance and only holds a credible share in the UK where it is down to about 20 percent share. This leaves the UK liquid share at over 40 percent and growing, but behind the continent where liquids passed the 50 percent mark in 2009. Liquids are typically promoted for low wash temperatures and helped the region move down from the 60°C wash temperature range. Liquids were positioned for 40°C washes and have increasingly been pushing for 30°C. The amount of water used is also on the decline in laundry with better machines now having less than a ten litre wash bath. And in selling, promotion remains key. In Germany, 50 to 60 percent of detergents are bought with coupons while in the UK, the 2-for-1 offer remains highly popular. Moves to more concentrated liquids have been developing, as in other regions.

Detergent formulators utilize large quantities of anionic surfactants, some of which are produced captively from purchased intermediates. The three majors and a few smaller producers have captive sulfation/sulfonation facilities in the region. The captive production is not geographically consistent. In the North, outside the UK, there is little captive, while the highest presence is in Italy. Ethoxylates are purchased since detergent producers have no ethoxylation capacity in-house. After the sale of Cognis in 2001, Henkel maintained a supply relationship with Cognis, but as contracts ran out, Cognis became more independent, working to pick up business at other accounts where the integration factor with Henkel had interfered. Other major players in household products include SC Johnson and Jeyes. Two of the most important private label makers are McBride and Dalli Werke.

**Personal Care**

Many of the leading West European household product producers are also leading personal care companies: Henkel, Unilever and Procter & Gamble. In key markets, L’Oreal and Beiersdorf can be more important. In a few locations, surfactant integration by the household producers Unilever and P&G to make alcohol ethoxysulfates, the largest-volume surfactant used in personal care products is used to advantage. But these producers toll and buy more than they make for personal care products.

A recent shift in consumer behavior has been witnessed. The personal care market has traditionally been dominated by premium label products. Being conscious of the economic recession, consumers have started to use more private label products. The inroads of private label first seen in Spain have progressed on into top markets like Germany.

The demand for green products continues to show excellent growth over the past several years. The public and certifiers are faced with inconsistent standards for the criteria of qualifying green ingredients. Several certification labels exist, Germany’s Blue Angel, the Nordic Swan, and the EU Eco-label (EU Flower), do not apply consistent guidelines. The European Commission recently revised the rules governing the EU Ecolabel scheme by adopting the changes at the end of 2009. The revision streamlines procedures while maintaining the EU Ecolabel’s high environmental standards. For more than a year, European certification agencies have been trying to harmonize to an industry standard. In June 2010, a set of standards for natural and organic products was released.

**I&I**

Thousands of companies participate in the I&I market; a few operate on a regional or even global level, but the majority serve local country or sub-regional markets. The I&I cleaning market can be subdivided into a variety of categories including: hard surface cleaning (HSC), dairy and food plant cleaning, commercial dishwashing, laundry, dry cleaning, carpet cleaning, hand cleaners, metal cleaning, car wash, and transport vehicle cleaners.

**Industrial**

The following table lists some of the largest surfactant customers in the major industrial end uses in West Europe. The industrial segment has been hit much harder by the global economic recession than other segments.

<b>CENTRAL &amp; WEST EUROPE – MAJOR INDUSTRIAL SURFACTANT CUSTOMERS</b>	
Agricultural chemicals	
Oilfield	
Paint	
Paper	
Plastics and elastomers	
Synthetic Rubber	
Textiles	

**SURFACTANT CONSUMPTION**

The consumption of primary surfactants in Europe totaled [redacted] million tons. The following table summarizes consumption by end use for 2009. Overall, consumption levels are down by [redacted] percent from 2008 levels.

<b>CENTRAL &amp; WEST EUROPE - CONSUMPTION OF PRIMARY SURFACTANTS BY END USE, 2009 (thousand tons)</b>				
Surfactant	Household	Personal Care	Industrial (Includes I&I)	Total
Linear alkylbenzene sulfonates		--		
Alcohol ethoxysulfates				
Alcohol sulfates				
Alcohol ethoxylates				
Alkylphenol ethoxylates	--	--		
TOTAL				

**Household**

The economic condition in Europe has been slow in recovery. And the once booming eastern part of Central Europe seen earlier in the decade may suffer the hardest recovery. In the first quarter of 2009, the unemployment rate in the EU27 for those aged 15–24 was 18.3 percent. The official unemployment rate in the 16 countries that use the euro was 9.5 percent in May 2009. Subsequently, this rate has risen and stands at ten percent today. Europe’s young workers have been especially hard hit. As with most of the western hemisphere, consumer spending has not recovered and is still considered to be down. Across Europe, many countries are struggling with the fallout from the economic crisis, in which their governments intervened to support banks that teetered toward collapse following risky investments. The spread of economic woes forced the European Union as a whole to arrange an emergency bailout for the Greek economy. Ireland, already reeling from a banking crisis that is threatening its financial credibility, suffered another recent setback when unveiled that its ailing economy shrank 1.2 percent in the second quarter of 2010.

Household surfactant consumption declined by [redacted] percent during 2009 with [redacted] tons of surfactant consumed. Household markets were affected by destocking and the changes in consumer buying patterns. Deformulations have been more pronounced in the Central European area as a result of the crisis. And the move to HDL, which in many cases plays out more among the liquid fine fabric brands, is a positive step for surfactant consumption.

LABS declined by [redacted] percent during 2009, when compared to 2008 levels in the household segment. AS remained relatively flat, declining only marginally in tonnage, but overall showed a [redacted]. AES also declined from 2008 levels, but only marginally at [redacted]. AE suffered along with LABS in the household area, as consumption dropped by [redacted] for the year.

### Personal Care

Despite a transition from brand products to private label, the personal care industry has been reported to be a resilient sector during the global economic recession. Surfactant use in the personal care sector was the only category that showed an increase in 2009, over 2008 levels. The primary surfactants used in personal care, AES, AS and some AE, all showed slight increases during 2009, bringing overall consumption levels up by one percent.

### I&I and Industrial

Industrial surfactant consumption declined by over [REDACTED] during 2009, showing the largest percent in decline of the three sectors.

LABS is utilized in a large number of industrial processes that include I&I cleaning, agricultural chemicals, plastics and elastomers, textiles and several miscellaneous uses. A significant decline seen during 2009 has been attributed to the global economic recession.

AES has relative limited use in industrial applications but it is mainly used in I&I cleaners, including commercial hand dishwashing and car wash applications. AES is also used in emulsion polymerization of plastics and elastomers. Other minor use areas include textiles and in the production of wallboard. A slight decline in consumption has been seen during 2009, falling about 2,000 tons from 2008 levels.

AE is used in all types of cleaners, agricultural chemicals, pulp and paper chemicals and in textile processing. A shift from APE to AE and other nonionic surfactants has been going on for years. This conversion will no longer drive increased AE consumption, as it appears done. AE saw a [REDACTED] decline in the industrial sector, declining more than its use in the household sector.

APE use was down the by the largest percent but only modestly in nominal terms. APE is still allowed in derogated applications where and when it is part of a registered formulation. However, many manufacturers have advanced with APE-free formulations. Although still produced in Western Europe, local consumption has been dropping and the produced material is largely being exported. At the same time, some material is still seen being imported into the region from Russia. APE use is off significantly in the western area but in some of the Central European areas, the substitution process still has opportunities.

# Surfactant Developments

A quarterly newsletter covering primary surfactants

Sample

## SURFACTANT DEVELOPMENTS NEWSLETTER QUARTERLY REPORT CALENDAR, 2014-2018

Year	Issues and Developments	In-depth Profiles	Regional Coverage
2018	Linear Alkylbenzene Sulfonates	Evonik	
	Surfactant Producer Review		North Asia
	Feedstock Review		Central & West Europe
	Year End Review	Sasol	
2017	Linear Alkylbenzene Sulfonates	Solvay	
	Oleochemical Update		North America
	Feedstock Review		Latin America
	Year End Review	KLK	
2016	APE Replacements	Dow	
	Sustainable Surfactant Programs		Southeast Asia
	Feedstock Review		Central & West Europe
	Year End Review	Clariant	
2015	Alcohol Ethoxylate Review	BASF	
	Supply Realignment		North America
	Feedstock Review		Latin America
	Year End Review	Huntsman	
2014	Alcohol Sulfates Profile	Sasol	
	Surfactant Product Review	Chemical EOR	North Asia
	Feedstock Review		Central & West Europe
	Year End Review	Shell	

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