



SURFACTANT DEVELOPMENTS NEWSLETTER

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END USE AND CUSTOMER NEWS

Era-Henkel Production Increase - Era-Henkel (St Petersburg, Russia) has announced plans to increase its household chemicals production volume by 13.2% in 2003. This is forecast to increase the production output from 2.65 billion rubles (U.S.\$87 million) in 2002 to 3 billion rubles (U.S.\$98.7 million) in 2003. These increases follow a successful year in 2002 during which performance figures were 23% higher than 2001.

New Products by Procter & Gamble - Procter & Gamble has released two new product extensions to its home-care brands with Dawn Power Dissolver^R spray and Febreze Allergen Reducer^R fabric refreshner. Dawn Power Dissolver^R is marketed as a pre-treater for baked-on, burned-on foods, which can also be used to clean other kitchen surfaces. Febreze Allergen Reducer^R hopes to target an allergy-control segment where other brands have failed. Both products are commercially available.

P&G launched Mr. Proper^R laundry detergent in Germany during the first quarter this year. Initial sales have been reported to be going very well.

P&G Shares in Wella - Procter & Gamble is in the process of purchasing the majority stake in Wella. An agreement between the parties was reached in March 2003. This is said to be part of Procter & Gamble's ambition to grow in Europe by 75%. Procter & Gamble is making offers to purchase the remaining shares in Wella and is said to be close to a purchase from shareholder rival Henkel, who has been opposing the purchase by Procter & Gamble.

Future of Beiersdorf Still Uncertain - Insurer Allianz is still looking to sell its 44% share of Beiersdorf for the right price. Procter & Gamble was rumored to have made a bid to Allianz for its share. However the companies did not agree on a price. In addition, Tchibo coffee group, the other major shareholder in Beiersdorf, expressed interest in purchasing the Allianz shares itself. Unilever and Johnson & Johnson are also said to be interested in the sale.

Aventis Sells Holdings in Rhodia - Aventis SA sold 17.8 million shares in the chemical company Rhodia SA to Credit Lyonnais SA. The shares represented about 10% of Rhodia's share capital and were sold for €99.4 million. Aventis now holds 27.5 million Rhodia shares, equivalent to 15.3% of Rhodia's share capital. Aventis is obliged to sell its holdings in Rhodia by 2004 in order to comply with the EU competition authorities' conditions for approving the merger between Rhone Poulenc and Hoechst of Germany which formed Aventis. Rhodia was spun off from Rhone Poulenc in 1999, prior to its merger with Hoechst.

Unilever to Sell Detergent Plant in Georgia - On March 4, 2003 Unilever signed a letter of intent with Huish Detergents for an agreement on the sale of Unilever's

Cartersville, Georgia plant. The plant currently produces Unilever's Wisk[®], all[®] and Surf[®] laundry powders and tablets. The agreement involves Huish continuing to operate the plant, serving as a co-packer for Unilever. Unilever's motive to sell the plant is part of its strategy in a supply chain based on key sites, simpler business processes and the restructuring or divestment of under-performing businesses. Unilever aims to cut costs and have more efficient operations.

Improved Air Quality using Surfactants - The Port of Los Angeles' container terminal operators announced plans to install diesel oxidation catalysts (DOCs) in their marine terminal equipment engines and reduce emissions by half. When coupled with emulsified diesel, a blended fuel of water and surfactants, DOCs reduce nitrogen oxide emissions by 20 percent and diesel particulate matter by 50 percent. The use of emulsified diesel fuel has been employed for over a year with three of the six container terminals now using it in all of its terminal equipment. The Port's goal is to have all standard diesel-powered marine terminal equipment use emulsified fuel.

FINANCIAL RESULTS

Ecolab Double-Digit EPS Gains in First Quarter 2003 - Ecolab experienced record sales in the first quarter 2003, increasing by 11% to \$876 million compared to the same period in 2002. Most of the global growth was from food-service markets. Ecolab's United States Cleaning & Sanitizing operations increased by 6% over the first quarter 2003 led by gains in Institutional, Kay and Professional Products operations.

Dial Posts Profit for First Quarter 2003 - Dial Corporation reported a first quarter profit for 2003, versus a loss during the same period in 2002. Most of the growth has been attributed to Dial's key laundry brand, Purex[®]. Dial's laundry care sales increased by 11.3%, while personal cleaning sales rose by 1.9% as liquid hand soap and new products counteracted decreased demand for industrial and specialty soap.

Procter & Gamble Third Quarter 2003 Results - Procter & Gamble reported healthy third quarter 2003 results on April 28, 2003. Unit volume was up by 18% in health care and by 30% each in oral care and pharmaceuticals. Beauty care volume was up by 9% with sales 10% higher than the same period in 2002. This is mainly attributed to strong growth in hair care and hair colorants. Fabric and home care volumes increased by 9%, with sales up by 8%. Some of P&G's major brands experiencing volume growth include Tide[®] up by 10%, Ariel[®] up by 9%, Dawn[®] up by 1.6%, Cascade[®] up by 2% and Swiffer[®] up by 17%. Overall, P&G experienced an 8% growth in sales.

Shell Makes Large Profit in First Quarter 2003 - Royal Dutch/Shell Group reported a 45% rise in revenue in the first quarter of 2003, attributed to higher oil prices. Shell's operating profit rose 98% and pre-tax income more than doubled to \$9.21 billion from \$4.01 billion. Shell Transport & Trading, which represent 40% of the group, gained 1.8%, while 60% owner Royal Dutch was up 0.3%. Despite these gains, Shell experienced losses in Nigeria, where it lost 10,000 barrels of oil a day during the first quarter due to ethnic violence in the country, in addition to about 60,000 barrels a day of crude oil at Iran's Soroush oil field due to the war in Iraq. About 15,000 barrels a day were lost during the long-running strike by workers in Venezuela.

To the contrary, Shell Chemicals posted a first-quarter net loss of \$15 million this year, due to a \$92 million one-off charge posted to cover restructuring and asset write-downs at its U.S. operations. Without this charge, profits remained equal to that of last year's \$75 million. Shell Chemicals reported a 69% increase in sales, due to higher volumes, but experienced a decline in cracker margins due to high gas feedstock prices.

SURFACTANT PRODUCER NEWS

PMD Project For EO and Derivatives Complex Delayed - Project Management & Development Co. (PMD) has delayed finalizing licensing and offtake deals for its planned ethylene oxide and derivatives complex in Al-Jubail, Saudi Arabia due to parties failing to reach mutual terms of agreement. The deal, originally expected to be signed before Christmas 2002, was for the licensing and offtake activities of methylamines and derivatives unit, capable of producing 50,000 tons/year of methylamines, 50,000 tons/year of di-methyl formamide, 15,000 tons/year of choline chloride and 20,000 tons/year of methyl diethanol amine and dimethyl ethanolamine. Also included in the complex was 150,000 tons/year of EO production, 100,000 tons/year of ethanolamines and 85,000 ton/year of ethoxylates. A foreign licensor and offtaker has been selected for the EO and ethanolamines project and PMD plans to sign the agreement soon. PMD plans to export output from the EO/ethanolamines and methylamines and derivatives projects outside the Middle East, while the ethoxylates will be sold within the region. Start-up is scheduled for the middle of 2006.

New Mexican Plants for INDESA - Industria Nacional de Detergentes SA (INDESA) part of the FERMO Group, is installing new sulfonation and powder detergent plants in San Luis Potosi, north of Mexico City. The new plants will consist of 30,000 tons/year sulfonation and 150,000 tons/year powder detergent capacities and are expected to be started up in December 2003.

Huish Methyl Ester Sulfonate Plant - Huish is in the process of getting its new MES plant into commercial operation. The plant has been undergoing a series of trials and tests and has produced some material for full scale trials. Unique to this product is the use of plant oils, i.e. palm, coconut and others, as the main feedstock. This would reduce the dependence on petroleum feedstock currently used in Huish detergents and by other producers. The new products are more biodegradable and environmentally friendly. And MES is from a renewable resource. The driving force behind this development is the opportunity for MES based on low-priced oleochemical feedstocks to effectively compete with higher priced LABS. The result would be an overall price reduction for laundry detergents, particularly the private label ones that Huish supplies to many major retailers.

Specialty Industrial Products, Inc. - Specialty Industrial Products, Inc. (SIP) has been declared bankrupt, and its 11 buildings and 16.5 acre ester and quat chemical plant have been put up for sale. Lubrizol announced in May 2003 that it has purchased the multi-purpose SIP chemical plant in Spartanburg, SC and the adjacent 104 acres which it will use for future expansion. Lubrizol currently manufactures foam control additives at its plant in Fountain Inn, SC and will eventually move these operations to the plant in Spartanburg and use the Fountain Inn plant for the production of other industrial products.

Clariant - Clariant is in the process of bringing on stream its ethoxylation plant in Coatzacoalcos, Mexico. The fourth and final reactor was scheduled to be brought on stream in April, 2003. When all reactors are fully operating, total capacity will be between 40,000 and 50,000 tons per year. Clariant recently closed its ethoxylate plants in Santa Clara and Cuernavaca, Mexico. These plants were old and ethylene oxide had to be shipped over 600 miles from the Pemex plant which created expensive logistics for the hard to handle raw material. The new ethoxylation plant is in an industrial site just a few miles from the Pemex ethylene oxide plant and will allow easier and safer transportation of the ethylene oxide. Clariant purchased Christianson, Mexico's largest surfactant maker, in 2000 and this new plant provides the opportunity to not only improve the manufacturing efficiency but to expand its Mexican surfactant business.

Canamex SA - Canamex is reported to have some financial difficulties that have taken some time to sort out. The Cholula (Puebla) ethoxylation plant has been retained by the Bernat family and renamed BC Chemicals. The ethoxylation plants in Guadalajara and in Coatzacoalcos are reported to be operating but in the hands of the banks and additional information about the disposition of these plants is not available at this time.

Optimal Group - The Optimal Group (a joint Venture with Dow [formerly Union Carbide] and Petronas) started its new 85,000 tons/year ethoxylation plant in Kerteh, Malaysia in mid 2002. An explosion on April 25, 2003 took out the oxygen unit but it was back on stream on May 15.

Silk-Derived Surfactant by Kawaken Fine Chemicals - Kawaken Fine Chemicals of Japan is going to undertake full-scale production of a silk-derived peptide type surfactant under the "Kawasilk" trade-name. The surfactant is the sodium salt of hydrolyzed silk and lauric acid, produced by combining a silk-derived peptide with natural oil-derived lauric acid.

The surfactant exhibits good foaming properties in both soft and hard water, and is mild on hair and skin due to the smoothness of silk. It is of particular interest for application in hair care products such as conditioners. Progress towards incorporation of the surfactant in commercial-scale formulations has recently intensified. In response, Kawaken Fine Chemicals is proceeding with plans to increase production at its Saitama site, from pilot plant scale to a 30-40 ton/year production capability during the 2003 fiscal year.

Sasol Takes Over Chinese Company - Sasol has increased its stake in China's Condea Nanjing Chemical Company to 100%, renaming the plant in Shanghai to Sasol Chemicals. Sasol has been looking for options to license its coal-to-liquid fuels technology in the region.

Shell to Close its Lubricants Plant in Martinez, California - Shell announced in February 2003 that it would cease manufacturing of naphthenic base oils at its lubricants plant at the Martinez, California refinery on September 1, 2003. This closure will impact the metal working fluid market, which is dependent on soluble oils and,

therefore, emulsifiers that can confer anti-corrosion effects and are based on the use of medium-molecular weight sodium petroleum sulfonates. These products had been provided as a byproduct of naphthenics refining. Shell had been the predominant supplier of these natural sodium sulfonates. The raw material void is expected to be filled by synthetic substitutes for sodium sulfonates and non-sodium sulfonates emulsion chemistries as well as other natural sulfonate manufacturers.

Nizhnekamskneftekhim JSC News -The oligomer plant of Nizhnekamskneftekhim JSC (NKNH) launched a new neonol production unit in September 2002 in cooperation with the Scientific and Engineering Centre of the company. The new neonol, a C₈ alpha-olefin based APE, is used as a feedstock for detergent production. The neonol facility of NKNH produced over 70,000 tons of surfactants in 2002 and exported 41,000 tons or about 59 percent of production.

Akzo Nobel Restructures Surface Chemistry in North America and Europe - Akzo Nobel Surface Chemistry, a business unit of Akzo Nobel Chemicals Group, has started an efficiency program that primarily impacts the European and North American surfactant operations. The measures include staff reductions of about 200 employees, — about 120 in North America and 80 in Europe. The reductions in North America will mainly be in production, administration, R&D and sales. Reductions in Europe will occur in administration, R&D and sales.

Akzo Nobel Surface Chemistry Group has carried out investments in Europe, North America and Asia in the last few years. In addition, the 2001 acquisition of Crompton's Industrial Specialties business was made to establish the basis for the further growth in fabric care, cleaning, agro-surfactants and oilfield chemicals. The reorganization will increase the efficiency in meeting the needs of these markets and will support the profitable growth in these market areas.

Nippon Petrochemicals to Increase LAB Capacity - Nippon Petrochemicals (NPC) has announced plans to increase its LAB capacity to 90,000 tons per year at its Kawasaki, Japan complex. The construction is due for completion in July 2004. NPC also intends to cease production at its 50,000 ton per year BAB plant in August.

PRICES

Subscribe to the *Surfactant Newsletter* for a detailed, bi-monthly report of up-to-date surfactant pricing issues.

TECHNOLOGY REVIEW

Arylalkylsulfonic Acids Derived From Alkylation of Aromatic Mols and AOS Acid -

The Stepan Company has applied for both a U.S. patent (US Appl. 922,457) dated August 3, 2001 and an international patent (PCT Int. Appl. WO 03 14,070) dated Feb. 20, 2003 for a process using a proprietary acid catalyst for the conversion. The applications also include numerous applications and prototype formulations.

Aryl Sulfonate-Formaldehyde Condensate Oligomeric Hydrophobic Dispersants -

The Procter & Gamble Company has applied for both U.S. (US Patent Appl. PV347,753) Jan. 11, 2002 and international patent (PCT Int. Appl. WO 03 15,906) for a composition patent on aryl sulfonate (e.g., naphthalenesulfonic acid)- formaldehyde condensate oligomeric hydrophobic dispersants for use in laundry detergent compositions. The selection of repetitive or mixed arylene units, linear or branched chain C₁₋₄ alkyl ethers, C₂₋₄ linear or branched alkylene and water soluble cation, sulfonate, amino groups are described. Capping units are selected from H, (un) substituted aryl groups with increased hydrophobic soil dispersency.

Internal Olefin Sulfonic Acids - The Lion Corporation of Japan has applied for a patent describing the preparation and use of internal olefin sulfonates. (Jpn. Kokai Tokkyo Koho JP 2003 81,935) dated Mar. 19, 2003. The claims are for improved surfactant properties and excellent detergency. The preferred cis/trans ratios and isomer distributions are defined. Suggested applications in granulated detergents for laundry and dishes, and shampoos are included.

A Convenient Synthesis of Quaternary Ammonium Gemini Surfactants From Long-Chain Alkyldimethylamines and Epichlorohydrin - This research appeared in *Synlett* 2002, (11) 1811-1814. The article describes a selective synthesis for bis-quaternary ammonium salts from epichlorohydrin and long chain alkyldimethylamines. The reactions are carried out in the presence of the corresponding amine chlorohydrates as functional surfactants.

Applications of Functional Surfactants - A review of functional surfactants, authored by Luk, Yan-Yeung, Abbott and Nicholas L. of the Dept of Engineering, University of Wisconsin-Madison, WI 53706 USA was presented in a publication in *Current Opinion in Colloid and Interface Science* 2002, 7(5,6), 267-275; Elsevier Science Ltd. Peptide-based surfactant, carbohydrate-based surfactant, redox-active surfactant and polymerizable surfactant were discussed.

Production Methods For Sulfonation and Surfactants - A Lion Patent (Jpn. Kokai Tokkyo Koho JP 2003 81,933) dated March 19, 2003 was issued. The claims are for a process to produce a variety of sulfonated surfactants with good color and high conversion rates.

Molecular Structures and Preparations of Silicone Nonionic Surfactants -

Du, Liu, Lu (School of Chemical Engineering, Nanjing University of Science and Technology, Nanjing, People Republic of China 210094) *Huaxue Tongbao* 2002, 65(11), w89/1-w89/7 (CH), Huaxue Tongbao Bianjibu. A review on synthesis, properties, and applications of silicone nonionic surfactants.

New Betaine Esters - Goldschmidt, AG, Germany was awarded a patent Ger. Offen. DE. 10,132,174 dated March 27, 2003 for a process to produce new betaine esters with the general formula $(R^1 C(CH_2)_N^+ R_2 R_3 (CR_4 R_5) CO_2 (Z_1 O) R_6)$. The new process offers betaines with broader application potential for use in cleaning and cosmetic compounds.

Optimization of the Linear Alkylbenzene Sulfonation Process - Roberts, David W. (Unilever Research and Development, Wirral, UK) *Organic Process Research & Development* 2003, 7(2), 172-184. This work describes a computational Chemistry study, supported by an experimental relative rate study on the reaction pathways occurring in the falling film reactor.

Manufacture of Discoloration-Resistant Odorless Alkylene Oxide-Sugar Adducts - NOF Corporation, Japan was issued a patent, Jpn. Kokai Tokkyo Koho JP 2003 96,182 dated April 3, 2003, for the production of improved products useful for surfactants and cosmetic oils. The improvement is achieved by removing reductants to less than 1.0% by treatment with mixed metal oxide-based absorbents and/or 0.001-2.0% reducing agent.

Method for Preparing Cationic Surfactants and Fabric Softener Compositions - LG Household & Health Care Ltd., S. Korea applied for a patent (PCT Int. Appl. WO 03 27,057) for a process to produce an improved cationic surfactant by reacting a fatty acid and an amine, converting the resulting amide into a tertiary compound and quaternizing with neutralization and a fiber softening composition using it. The cationic surfactant shows good water solubility and softening, anti-electrostatic and dispersion properties.

Preparation of Cationic Surfactants Containing Ester Groups in the Molecule - LG Chemical Ltd. S. Korea received patent US6414170, dated July 2002 for a process to prepare a hydrate alkyl quaternary ammonium compound cationic surfactant containing an ester group and a hydrophilic hydroxyl group. The claims are for a process to prepare cationic surfactants by reacting tertiary amine derivatives, fatty acid and epihalohydrin in the presence of a solvent. The resulting product has excellent softness, antistatic properties and biodegradability.

Photodegradative Surfactants: Photolysis of p-Dodecylbenzyltrimethylammonium Bromide in Aqueous Solution - Itoh, Yoshihiro; Yamamoto, Kenji; Shirai, Hirofusa (Dept. of Functional Polymer Science, Faculty of Textile Science and technology, Shinshu University of Nagano, Japan 386-8567). *Chemistry Letters* 2003, 32(1), 8-9 (Eng), Chemical Society of Japan. UV radiation degraded benzyl containing cationic surfactant above into non-surfactants which can be separated from aqueous solution by

precipitating with CaSO₄.

Cationic Sugar Surfactants from Ethoxylated Ammonium Compounds and Reducing Agents - Akzo Nobel N.V. was issued patents US6432907 dated August 2002, and US 6503880 dated Jan. 2003 which teaches a process to prepare cationic sugar surfactants with improved biodegradability. These materials can be used as hydrotropes for surfactants in alkaline cleaners. They are obtained from ethoxylated quaternary ammonium compounds and reducing saccharides or alkyl glycosides.

Branched Surfactant Manufacture - A patent US6433207, dated August 2002 was issued to Procter & Gamble for the preparation of branched chain feedstocks for deterative surfactants. What is claimed is a process to produce branched chain ethoxysulfates by dimerizing alpha-olefins and either isomerizing and subsequent reaction with CO/H₂ under Oxo conditions, or performing the Oxo reaction directly with the olefin. The formed branched chain alcohols are then ethoxylated and sulfated to yield the corresponding branched ethoxy sulfates.

Process For Preparing a Modified Alkyl Aryl - Patent # US 6525233 dated February 2003 was issued to Procter & Gamble for a process to produce particular branched surfactants. The process depends on the use of certain adsorptive separation steps to secure certain branched hydrocarbon fractions which are subsequently used as alkylating agents for surfactant preparations.

New Esterquats - Kao Corporation was issued a patent, US 6465419, dated Oct. 2002, for the preparation of novel esterquat cationic surfactants for softening and conditioning natural and synthetic fibers such as textiles, paper and hair. The esters are derived from alkanolamines, dicarboxylic acids and fatty alcohols.

Ether Capped Poly(oxyalkylated) Alcohol Surfactants - Two process patents, US 6482994, dated Nov. 2002 and US 6495727, dated Dec. 2002, were issued to Procter & Gamble. The claims are for preferred ether capped nonionic alcohol surfactants which exhibit superior grease cleaning abilities and improved spotting/filming benefits.

Tartaric Acid Diesters as Biodegradable Surfactants - Air Products and Chemicals was issued a patent US 6544591 dated April 2003, for the use of certain tartrate diesters in water based systems which are essentially free of hydrocarbon solvents. The patent claims a method for reducing dynamic surface tension required for applying a coating of water based compositions to a surface.

PROFILE DOW CHEMICAL

Dow Chemical has emerged as one of the world's 15 largest surfactant suppliers. The company achieved this status largely through acquisition of companies with surfactant production as part of their chemical business. In all cases, other businesses, such as polymers, plastics, or agricultural products, were the driving force for the acquisitions. The Union Carbide acquisition in 2001 gave Dow its pre-eminent global position in ethylene oxide, as well as a major role as a supplier of alkoxyated surfactants. The acquisition of Sentrachem, Ascot Chemical and Angus Chemical brought biocides, pharmaceutical intermediates, Hampshire Chemical and Halterman to Dow.

The surfactants business has been integrated into a new "Performance Chemicals Business Group". These specialty chemicals business units have been re-organized as follows:

<u>Industrial Chemicals</u>	Functional Solutions & Surfactants, Biocides, Chelants and Performance Fluids
<u>Oxide Derivatives</u>	Specialty Alkanolamines, EO and PO based Glycol Ethers, and Ethyleneamines
<u>Specialty Polymers</u>	Acrolein derivatives/Specialty Ketones/Specialty ENB Monomers, Acrylic Acids and Esters, Solution Vinyl Resins, Specialty Resins & Powders, Superabsorbent polymers, Naphthalene sulfonate, formaldehyde condensates and others
<u>UCAR Emulsion Systems</u>	Vinyl Ester latexes, all Acrylic, Styrene-acrylic and Vinyl Acrylic latexes and Rheology modifiers
<u>Water soluble polymers</u>	Cellulosics, Water soluble resins, Amerchol [®] products for PC including Hamposyl [®] surfactants
<u>Custom and Fine Chemicals</u>	Angus Chemical Products, Dow Halterman Custom Processing, Halterman Products and Dowpharma

Dow's surfactant products include the following:

- Dowfax[®] surfactants; Alkoxyated diphenyl oxide derivatives are 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 appears to be

emulsion polymerization. Other markets are cleaning compounds, textile dyeing, oilfield and some miscellaneous end uses.

- Hampshire Chemical produces Hamposyl[®] surfactants; acyl sarcosinates, acyl glutamates, and a unique chelating surfactant, acyl ethylene di-amine triacetic acid, in Nashua, New Hampshire for the PC market.
- Tergitol[®] and Triton[®] nonionic surfactants; the Triton[®] products were acquired from Rohm and Haas in 1990. These included OPE, NPE and others.

Dow also offers via the Union Carbide acquisition, APGs, secondary alcohol alkoxyates and lower chain linear primary alcohol alkoxyates for specialty surfactants. The Min Foam[®] line of products are based on secondary alcohol + EO/PO. Additionally, Dow offers EO/PO copolymers, ethoxylated amines, phosphate esters, sulfosuccinates, and other specialties. The EO/PO block copolymers and EO/PO copolymers are produced in Europe and the U.S.

Dow manufactures two special surfactant types which are not marketed by its surfactant group. Daxad[®] dispersants — naphthalene sulfonate formaldehyde condensates (NSF) — are made by Hampshire and supplied to W.R. Grace Co. for concrete and oil well cementing. The other type is Dow's polyglycols.

Dow has recently come under considerable financial pressure to achieve acceptable margins in its chemical operations. High and volatile hydrocarbon costs have greatly affected most chemical companies. Dow has been saddled with the added burden of fully integrating the \$7 billion Union Carbide acquisition with its relatively higher basic raw material manufacturing costs, and asbestos exposure (P.J. Juveken of Salomon Smith Barney).

Dow is planning to shut down two non-competitive ethylene crackers, which were part of the Carbide acquisition, in Texas City and Seadrift, by the end of 2003. The company has announced its intention to build a new 900,000 ton/year, efficient ethylene cracker on the Gulf coast in Seadrift, Texas. According to informed sources within Dow, despite these "disastrous" higher cost issues, the UC acquisition has resulted in important efficiencies of scale for the company.

Dow is facing large amounts of low cost ethylene-based feedstock coming onstream in the Middle East which it hopes to offset with its "Equate" joint venture in Kuwait. Equate supplies ethylene, EO and ethylene glycol.

As part of the Union Carbide acquisition, Dow also picked up a world class ethylene and derivatives project in Kerteh, Malaysia. This joint venture with Petronas, Optimal, was started up in 2002. Optimal has two surfactants reactors capable of producing 55,000+ tons/year of APE, EO/PO condensates, PEGs and others. One 30,000 ton/year reactor is dedicated to APE production.

Various strategies were examined for operating the units. Even though a sizeable amount of toll ethoxylation is done in the region, Optimal ruled out the tolling position a few years ago. This decision had a negative impact on supply strategies for Lion, among others. Some observers have wondered if Optimal and Sasol would make a deal to ethoxylate the new South African alcohols. This seems unlikely as Sasol appears to be pursuing an alcohol sales strategy in northern Asia.

Dow has announced plans to shut down its Nashua, New Hampshire plant. Nashua produces specialty surfactants for the PC industry and is considered a non-strategic asset. It remains unclear whether Dow plans to replace the production or to dispose of the operation entirely. Some observers see bidders lining up. Dow has also decided to discontinue production in Institute, West Virginia. The site is currently owned by Bayer.

In January 2003 Dow chairman, president, and CEO, Mr. Bill Stavropoulos announced severe cost cutting measures within the company. The plan is to improve volume and margins, divest non-strategic and under-performing assets, and reduce structural costs by \$400 million per year. Dow is anticipating improvement as a result of increased demand and limited announced capacity additions.

In response to spiraling increases for natural gas and other feedstocks (more than \$1.2 billion or 70% for Dow in first quarter, 2003 *WSJ* 4/24/03), surfactant producers have been forced to announce substantial price increases across the board. APE increases have essentially “stuck”, since all producers have increased their prices across all sectors of the market. Dow announced 3¢ in Feb., 5¢ in March and 2 more cents for May. All producers are looking for improved net backs as a result.

Dow's first quarter 2003 earnings report indicated that volume and value sales increased for the Performance Chemicals division. Additionally, strong volume gains were seen in the Emulsion Polymers, Industrial Chemicals, and Oxide Derivatives division. However, EBIT declined significantly for these two segments due to the dramatic increase in feedstock and energy costs.

COMMENTS FOR THE FUTURE

There are three routes for Dow to move the surfactant business forward. It can develop a hydrophobe position, expand geographically, or into new markets. This is a unique period in that new surfactant materials and processes are under consideration that have greater branching than was seen in the past. Certainly there have been ongoing efforts to develop various streams to gain higher values. UCC had been active and Dow was never able to duplicate the success of its diphenyl ether sulfonate, Dowfax. The development of a new hydrophobe remains an open possibility for future exploration.

Geographically, Dow's market penetration in North America is strong and it is unlikely to be improved. In Europe Dow has been building its market position for years and a new effort to exploit Asian markets began with the start of the Optimal JV in

Malaysia. As for end markets, there is room for action. Dow is well established in the household, I&I and industrial sectors. In personal care, Union Carbide's Amerchol has traditionally focused on lanolin derivatives and the highly successful Polymer JR^R. And now, the newly launched Dow Dispersion Sciences will concentrate on building its position in emulsion and dispersion systems for the highly competitive and lucrative skin care market.

In the household products sector, the Dow relationships are very good. The household market faces tremendous pressure on pricing due to overwhelming buyer leverage. This condition has evolved from the growth of huge buyers such as Wal-Mart, Costco and other "warehouse" retailers. One area for success in this sector lies with those suppliers that can bring demonstrable product benefits to the marketplace through product development and/or scientific breakthroughs which can capture protected technical achievements in new household products. Dow may be perceived as one who can partner with major formulators to realize this advantage.

In the industrial sector, Dow has had a very strong core area of paint, emulsion polymerization and coatings. Potential step-outs are limited. Textiles is no longer a vibrant sector in North America. Food is potentially attractive but tremendously challenging for a new market entry. AgChem was part of the earlier Rohm & Haas portfolio but the vital adjuvants business was retained when the surfactants were acquired by Carbide. The adjuvants were later bought by Dow Agrosience. Whether there is a future in ag surfactants is questionable. The overwhelming success of Monsanto's "Round-Up" herbicide leaves little on the table in the Ag sector that is not an amine ethoxylate. Other Ag outlets for surfactants do not have an attractive scale in North America.

Another difficulty for Dow in surfactants is a rotational approach to management which gives managers inadequate time to develop the necessary sensitivities to the complexity of the surfactant business. Maintaining a business is one thing but developing it into a strong global entity is quite another.

An important issue is to avoid the pitfall that has hurt the European nonionic market so badly. Dow has to prevent surfactants from falling into the rut of being merely a higher value outlet for EO. This would take the business quickly to the level of a "trading" company. Not that Dow is currently at risk of this happening, but the situation in five years could be different. There are other structural features that prevent this from taking place now. In Europe, the greater availability of hydrophobes allows a larger number of players to battle from both sides of the molecule. In AE in North America, only Shell is integrated. Shell and Huntsman battled it out several years ago when the APE market looked as if it was going away but this ceased when it became apparent that APE would remain an important nonionic market for years to come and the competition went quiet.

Dow is bringing breadth to the Union Carbide business and breadth to service accounts for multiple needs. Dow's approach is not that of the specialty chemical supplier nor the petrochemical producer. Dow brings chelants and other essential raw

materials, in addition to industrial workhorse surfactants, and the convenience and efficiency of multi-product sourcing to enhance customer relationships.

Dow now has an enlarged surfactants position, post-UCC. A leader is needed with a vision of how to build on this base. Frequently integration or a market focus has pushed companies or driven their activities. UCC was on that road and now Dow has to see if it will expand the vision and make the UCC acquisition something more than just the sum of its parts.

DOW INTERMEDIATE AND SURFACTANT PLANTS, 2003 (thousand tons)			
Plant Location	Process/Feedstock	Products	Capacity
NORTH AMERICA			
United States			
Institute, WV ^a	Ethoxylation	APE, EA, SAE, BP	91
South Charleston, WV	Ethoxylation	APE, APG, AE, Specialties	23
Seadrift, TX	Ethylene	EO	420
Freeport, TX	Ethylene	BP, SAE, Specialties	n.a.
Plaquemine, LA	Ethylene	Liquid PEG	281
Taft, LA	Ethylene	EO	665
	Ethoxylation	NPE, PEG	125
Edison, NJ (Amerchol)	Ethoxylation	Specialties	n.a.
Nashua, NH ^b	Condensates	Sarcosinates	n.a.
		Others	n.a.
Midland, MI	n.a.	n.a.	n.a.
Canada			
Prentiss, Alb.	Ethylene	EO	182
Montreal, Quebec	Ethylene	EO	70
WEST EUROPE			
The Netherlands			
Terneuzen	Alkoxylation	PEG	20
United Kingdom			
Wilton	Ethylene	EO	300
ASIA			
Malaysia			
Kerteh (Optimal)	Ethylene	EO	385
	Ethoxylation	APE, PEG, EO/PO block copolymers	85
Kuwait			
Shuaiba (Equate)	Ethylene	EG	400
^a Announced February 2003 that the Institute plant will be closing down during 2003. ^b Nashua plant to be closed by 2005.			

FEEDSTOCK REVIEW, PART I

ETHYLENE

REVIEW OF PAST YEAR

The ethylene market has faced an unprecedented convergence of negative factors over the last year. Global economic conditions hindered demand growth and depressed prices for derivatives. New ethylene plants, planned during the boom years of the late 1990s, started up in the U.S. and the Middle East. Global capacity increased 2.2 percent in 2002, much lower than the 6.2 and 7.0 percent increases in 2000 and 2001, respectively. In spite of this, operating rates were only 75 to 85 percent, depending on the region. Crude oil prices rose throughout 2002, and natural gas prices spiked in early 2002 and again in early 2003, causing feedstock and energy prices to skyrocket. The traditional producing regions of North America, West Europe and Japan were also faced with growing competition from the Middle East, where feedstock costs remain low and new ethylene and derivative production is mainly targeted for export markets. These factors combined to severely squeeze ethylene margins, and some higher-cost capacity was shut down.

During the first quarter of 2003, demand and prices rose, largely due to inventory building designed to hedge against potential supply disruptions and further price increases resulting from the pending war in Iraq. Since the war ended quickly without significant disruptions to the market, demand has softened again, with buyers using up their inventories in anticipation of lower prices.

North America

The North American ethylene market has suffered from all the factors outlined above – lackluster demand, overcapacity, low prices and high feedstock costs. The tremendous run-up in natural gas prices in the first quarter of 2003 finally enabled producers to raise prices, but the increases merely passed through higher costs, and margins have not improved. Overcapacity has been a major issue: North American ethylene capacity rose 6.4 percent in 2000, 5 percent in 2001, and 1.2 percent in 2002, reaching 35.8 million tons/year as of 1/1/03. Several older units, representing over 2.5 million tons/year of ethylene capacity, have either already been shut down or are scheduled to close this year.

North American exports of derivatives, especially polyethylene, have declined because these materials can't compete effectively with lower-priced products from Asia and the Middle East. One consultant estimates that in March 2003, margins for LLDPE sold into the Far East were \$400/ton for Saudi ethane-derived product; \$200/ton for Korean product, and negative by \$100/ton for North American product.

West Europe

The European ethylene market has been more in balance than the U.S. market during the last year. Although debottlenecking added 950,000 tons/year of ethylene capacity during 2002, no new crackers have come on stream, and there have been a number of unplanned outages. About 30 percent of Europe's 23.5 million tons/year of ethylene capacity was originally built in the 1960s and another 40 percent in the early 1970s. Given the maturity of the market, producers have favored lower-cost debottlenecking over costly investment in new crackers, even though newer facilities would significant lower operating costs.

European ethylene profitability over the last year has been dismal. Volatile feedstock costs have, at times, risen sufficiently to erase margins altogether. This has led some producers to challenge the traditional practice of settling ethylene contract prices on a quarterly basis. In early 2002, for the first time, there was no consensus on ethylene contract price increases, and second quarter settlements included an array of different increases, some monthly and some quarterly. Later in the year, as feedstock prices stabilized to a degree, ethylene contract pricing moved back toward the traditional quarterly consensus, but producers are still questioning the viability of this system.

Another significant factor in Europe is the constant threat of low-priced imports of ethylene derivatives from the Middle East and Asia. These imports have often undermined derivative pricing and increased ethylene buyers' resistance to price hikes.

Asia

Asian ethylene capacity grew 6.4 percent in 2001 and 4.4 percent in 2002, reaching 28.3 million tons/year as of 1/1/03. Most of the new capacity came on stream in China and India. Since the major economic crisis of the late 1990s, the Asian region has rebounded, with higher growth rates for ethylene and derivatives than any other region.

Asian markets tend to be more volatile than Western markets, and naphtha, ethylene and derivatives prices have fluctuated over a wide range during the last year. Naphtha bottomed out in November 2002 at US\$230/ton, only to rise to a two-year high of US\$307 in early January 2003. After staying close to US\$300/ton for a few weeks, naphtha began to climb, soaring to US\$385/ton by March 17th, and dropping precipitously to US\$293/ton the week after the war in Iraq began. The sharp spikes in feedstock prices have hurt ethylene producers, and some have suspended production for brief periods because they could not pass through the higher costs.

CURRENT SITUATION AND 2003 OUTLOOK

On a global basis, energy prices are expected to moderate for the rest of the year, but feedstock costs will remain higher than traditional historical levels. Ethylene producers are determined to avoid the low or non-existent margins experienced over the last year. They will aggressively seek price increases, and their efforts are expected to be at least partially successful. In addition, further consolidation and restructuring is expected, especially in Europe.

In North America, ethylene prices and margins are expected to be somewhat higher in 2003 than they were in 2002. Maintenance shut-downs will keep about 10 percent of U.S. capacity off line through July 2003, but Shell will start up a 544,000 ton/year cracker in Texas in July. Lehman Brothers forecasts that the average ethylene price in 2003 will be 26.8¢/lb versus only 22.2¢/lb in 2002, but a slow decline in ethylene prices is expected throughout the year. Natural gas prices have come down considerably from their peak in the first quarter, but are still around \$6 per million BTU, over twice the average price through the 1990s. They are expected to continue to decline, although very gradually. Ethylene cash margins are forecast by Lehman Brothers to average 9.4¢/lb for the last three quarters of 2003, after being only 5.0¢/lb in the first quarter; in 2002 they averaged 7.0¢/lb.

European ethylene operating rates, prices and margins are all expected to improve in the second half of 2003 after a difficult second quarter. Only two, relatively small ethylene capacity increases are planned; feedstock prices are expected to stabilize; and demand is forecast to pick up once the current derivative de-stocking is over.

In Asia, ethylene prices dropped in early May to around 18¢/lb in response to a fall-off in polyethylene demand from China due to the SARS outbreak there, and the drawing down of inventories built up ahead of the Iraq war. The SARS epidemic is expected to wane soon, but ethylene prices are expected to remain low through the second quarter, then fluctuate over a fairly wide range as they have in the past.

ETHYLENE OXIDE

REVIEW OF PAST YEAR

The majority of ethylene oxide (EO) is used captively to produce monoethylene glycol (MEG), which, in turn, is used to make polyester fibers and PET resins. Several other EO derivatives are mainly produced captively, including di-, tri- and polyethylene glycols, glycol ethers and ethanalamines. Surfactants are produced captively by some EO producers, but they also represent the largest merchant market for EO.

The economics of EO production depend mainly on the prices of ethylene feedstock and MEG. EO operating rates and decisions regarding capacity additions or

closures are ultimately driven by MEG. The global recession that began in 2000 caused a decline in MEG demand and pricing, and led to the closure of several EO/EG facilities. But demand turned around in late 2002 and early 2003, and this, coupled with planned and unplanned outages, tightened the market and pushed up prices. However, the SARS outbreak curtailed shopping in China, causing a sharp drop in demand for polyester and thus MEG in May, and MEG prices have declined worldwide.

North America

When one of Huntsman's EO reactors at Port Neches, TX exploded in December 2000, the company chose not to rebuild because the market prospects for MEG couldn't justify the investment needed to replace the equivalent of 100,000 ton/year of MEG capacity. The 2001 global recession caused a sharp decline in MEG demand and pricing, and North America felt the greatest impact because of relatively high feedstock costs that made exports uncompetitive with material from new Asian and Middle Eastern plants. This led Dow to idle its 350,000 tons/year EO/MEG unit in Taft, LA in December 2001.

Although demand for MEG rebounded in 2002, prices did not, and the continuing low prices, coupled with high ethylene costs, devastated margins. In mid-2002, BASF decided to exit the U.S. MEG market, closing two EO units that supplied MEG plants. Rising demand prompted Dow to restart its idled Taft unit in early 2003, but then during March and April, Dow shut down its EO/EG facilities in Texas, Canada and Malaysia for maintenance. Other producers also have maintenance shutdowns scheduled for the second and third quarters of 2003.

Strong demand for MEG, particularly for PET resins, caused a run-up in U.S. prices for MEG and EO during the first few months of 2003, as supplies were inadequate to meet demand and several producers put MEG on sales control. MEG contract prices rose from \$520/ton in January to \$800/ton in April. With MEG production so lucrative, surfactant producers had to compete for available EO by paying higher prices. EO contract prices increased 3¢/lb in March and 8¢/lb in April. But the sudden fall-off in global demand for MEG in May has brought contract prices for MEG down to \$550/ton for June.

West Europe

As in North America, the EO/MEG market in West Europe slumped in 2001 and began to recover in 2002. Margins had suffered badly in 2001, and producers sought and were able to obtain price increases by the second quarter 2002. In early 2003, the market tightened suddenly when an explosion at the air separation plant of its oxygen supplier shut down Clariant's EO/MEG production at the end of January, and Ineos had production problems the following week. These outages followed earlier production problems at Sasol's plant in Germany and BP's plant in France. Both Clariant and Ineos declared *force majeure* in mid-February, and prices for both EO and MEG rose quickly as supplies became scarce. Clariant lifted *force majeure* on March 5th, but

Ineos waited until after a scheduled maintenance turnaround in March.

Five other EO plants are undergoing scheduled maintenance turnarounds during the period of March through July, which has exacerbated the tightness. In mid-May, the second quarter price for MEG settled at €745/ton, up 23 percent from the first quarter price of €605/ton, in spite of weakening demand and falling spot prices. In mid-May the European spot price for MEG was under €550/ton.

Asia

A higher proportion of EO goes to MEG production in Asia, and demand for MEG for polyester fibers and resins has been growing steadily over the last year. Volatile prices for feedstock ethylene have at times crimped margins, but overall, Asian EO producers fared better in 2002 than their counterparts in Europe and North America. MEG contract prices rose rapidly in the first quarter of 2003, from US\$520/ton in January to nearly US\$800/ton by the end of March, due to continued strong demand. But in April, Chinese customers began to abstain from buying in an attempt to bring prices down, and as of the end of April, they had succeeded only partially, with suppliers offering MEG contract prices in the range of US\$710-750 per ton.

On April 18th, there was an explosion in a pipeline at the oxygen unit that supplies the EO unit of Optimal Olefins, the joint venture of Dow and Petronas at Kerteh, Malaysia. The outage occurred just about a month after the ethylene cracker and derivatives units were all restarted following a maintenance shutdown that began February 5th. Within ten days of the explosion, spot prices for MEG had risen by \$40/ton. But the rapid fall-off in demand in May due to SARS, plus the restarting of Optimal's EO/MEG units on May 15th, brought MEG prices down quickly to global levels of around \$550/ton by the end of May.

Other - Middle East

MEG is one of the main products to be included in new olefins and derivatives projects in the Middle East, and several world-scale EO/EG plants are either on stream or due to start up in the next couple of years. These projects are based on low-cost ethane feedstock and most of the output is targeted for export markets, primarily Asia and Europe. As the EO/MEG market has tightened in the last few months, there have also been exports to the U.S. Some of the planned new facilities are being designed to supply a portion of the EO for future local surfactant production, but this development is years away. Currently, only Turkey has ethoxylation capacity, and it is only a few thousand tons per year.

CURRENT SITUATION AND 2003 OUTLOOK

The recent softening of MEG demand and prices is expected to be short-lived, as by early June, spot prices in China had rebounded by around \$100/ton. Although there may be more volatility in the short term due to changes in the SARS situation, the global market for MEG is expected generally to be tight through the end of 2003, and

this will support elevated prices for EO. No new EO capacity is planned for 2003 in any region. Debottlenecking may help to ease the situation, but not before the end of the year. Ethylene and energy prices have already backed off of the extreme highs of the first quarter, but they are forecast to remain well above historical levels, keeping EO margins somewhat depressed throughout 2003 in spite of relatively high EO prices.

LINEAR ALKYL BENZENE AND NORMAL PARAFFINS

REVIEW OF PAST YEAR

Estimated world LAB capacity for 2002 was 3.03 million tons. After considerable activity in 2001, the year 2002 saw few capacity changes. In 2001, Sasol started up a 100,000 ton per year plant in Italy; Fushun in China increased both of its units to 100,000 tons; and Deten in Brazil increased its LAB capacity to 220,000 tons per year. In 2002, Kyowa Hakko shut down its 40,000 ton per year plant, due to declining demand for LAB in Japan.

CURRENT SITUATION AND 2003 OUTLOOK

The year 2003 should see a few capacity changes. The completion of Jin Tung's 72,000 ton per year plant in Nanjing, China was expected in the first half of 2003 and startup is expected near year-end. Two units, one 50,000 tons per year and the other 30,000 tons per year in Iran and Syria, respectively, were scheduled to start this year. An additional 25,000 tons from an expansion in Iran is also expected. India's Tamilnadu Petroproducts has pushed off plans to expand its LAB plant to 120,000 tons per year to 2004.

There are a few recent and upcoming events shaping worldwide normal paraffin capacity, which was estimated to be about 3.1 million tons in 2002. Petresa expanded its n-paraffin capacity in San Roque, Spain to 400,000 tons/year in late 2002. For 2003, Tamilnadu's expansion to 94,000 tons/year is expected to come in May. Other debottlenecks and upgrades may be taking place in the near future.

Pre-Iraq conflict anxiety early this year drove crude oil prices up to a high of around U.S.\$37 per barrel in mid-March and kerosene prices shot to over a dollar per gallon. This pattern was reflected further along the supply chain, and normal paraffin prices have come up to U.S.\$500 per ton, after about a year of prices below that level. Suppliers tried to increase the LAB price in the U.S. by 3-5¢ per pound at the beginning of April, but this did not succeed.

Once the conflict in Iraq actually started, crude oil supply fears quieted, and prices have come down to around U.S.\$29 per barrel. An additional factor in the price slippage is that the Venezuelan producer Venoco has stepped up production in the last few months in an attempt to overcome the losses it incurred during the two-month workers' strike. Despite the drop in raw materials prices, LAB producers will most likely

be keeping a close eye on market conditions. It remains to be seen whether price increases will be attempted for the third quarter.

FEEDSTOCK REVIEW, PART II

Subscribe to the *Surfactant Development Newsletter* for Part II of the Feedstock Review, to be included in the next issue. Part II will cover:

- Detergent alcohols
- Propylene Trimer/Tetramer
- Nonylphenol
- Others.