RAW MATERIALS

Surfactant markets await next bout of investments by South East Asia's plantation owners

The global market for fatty alcohols has shown significant changes in the recent past, which buck historical trends. While the oleochemical route to alcohols – starting from vegetable/animal oils & fats – has a dominant 70% share of the global capacity of about 3.3-mtpa, synthetic alcohols, produced from petrochemically-derived ethylene, still continues to have a robust 30% share of the market.

And the dynamics of both these markets is changing.

Demand for fatty alcohols, which has traditionally grown at about 4% per annum – enough to justify a new plant every year – is now growing faster due the strong move to liquid detergents, especially in developing countries, reformulation by at least one leading producer in the recent past and soaring demand from emerging markets, especially China.

New pricing mechanisms

Prices for oleochemicals, in general, are now being set by that of key oils from which they are derived – the most important of which is palm oil. Much of this – close to 90% – is produced in South East Asia, with Indonesia and Malaysia the two most important producers. Another important oil – from a surfactants perspective – is coconut oil (CNO). Together with palm kernel oil (PKO) – also derived from the palm tree – they are key raw materials for the all-important lauric alcohols (C12-C14 chain lengths), finding use in surfactants manufacture.

With the increasing of vegetable oils and fats for use in energy markets as bio-diesel, vegetable oil prices now move in a band where the lower level is set by the price of crude oil.

In the last few years, as demand for vegetable oils soared, natural fatty alcohol prices spiked beyond US$4000 per tonne in early-2011. A reduced palm crop in Malaysia in 2009 and 2010, impacting production of PKO, and stagnant production of CNO, also contributed to the increase. While prices have since dropped to levels of around US$2000 per tonne – as demand declined in the mid-2011 – there is now greater awareness amongst the end-user industries for the need for options.

Unfortunately for the user industries synthetic alcohol production was not much of an alternative during the era of high prices; much of the global capacity was sold out and could provide little relief!

Nevertheless, the high prices forced some level of reformulation, with a few detergent producers opting for actives such as methyl esters and their ethoxylates, as substitutes for linear alklybenzene sulphonate (LABS) and fatty alcohol ethoxylates respectively.

Prospects for synthetic oils

Mr. Norman Ellard, once a senior executive at Proctor & Gamble, and now a consultant, believes it is premature to write off synthetic alcohols – notwithstanding the move towards renewably sourced raw materials. All the more so with bright prospects for shale gas in the United States (and possibly elsewhere in the world), that could radically change the pricing dynamics of synthetic alcohols. "Synthetics could emerge as a major source of raw materials for surfactants with a strong price position and alpha-olefins could also see a comeback," he says, notwithstanding the high capital costs associated with these projects.

Ethylene markets in the US have already diverged from Europe and Asia, due to the availability of shale gas, and a slew of project announcements now point to a resurgence of petrochemical production in the country.

Enough oils for oleochemicals?

While the availability of lauric oils will continue to grow as palm cultivation expands – especially in Indonesia – this may not be adequate to cater to the about 36% increase in fatty alcohol capacity that is under planning for the next two years. Not all of this capacity will actually fructify, providing some balance between supply and demand. On the supply side, more and more of plantation owners are seeing oleochemicals as value-addition and have a "build it and demand will come attitude."

"The end result of this dynamic will be continued commoditization of products," says Mr. Ellard.

Ms. Krithika Thyagarajan, from Frost & Sullivan, a consultancy, sees the competitive landscape for oleochemicals intensifying with Indonesian plantation owners entering the oleochemicals space. "Green products can fetch a premium, but the question is how much?"

Table 1
Global capacity for fatty acids & alcohols
[Ktpa]

Country	Fatty acids	Fatty alcohols
Malaysia	2,330	492
Indonesia	1,600	624
China	1,500	720
India	500	400
Philippines	125	166
Thailand	25	100
Europe	1,500	1,000
USA	1,000	800
Others	800	400
Total	**9,380**	**4,702**

Source: S.C. Cheah

Mr. S.C. Cheah, a consultant to the industry, believes Malaysia's ability to ramp up oleochemicals production is unlikely to be as significant as Indonesia's, given the support the latter government is providing as incentives and export duties. "Oil producers who were content shipping oil are now investing in downstream production," he says. They are diversifying their product slate to include downstream products such as fatty acid esters, stearates and fatty alcohols. Mr. Tsuneharu Mukaiyama, Lion Eco Chemicals (Malaysia), a leading detergents producer, believes there is enough scope to expand palm oil production to meet the demand for oleochemicals for surfactants production.

Table 2
Global balance of fatty acid – supply & demand
[Million tonnes]

Location	Production	Demand	Excess
Asia	6.1	3.7	2.4
EU	1.5	1.2	0.3
USA	1.0	0.9	0.1
Rest of the world	0.8	0.5	0.3
Total	**9.4**	**6.3**	**3.1**

Source: S.C. Cheah

Mr. Anthony Feng, Global Head, Strategy for the Emery Oleochemicals Group – a vertically integrated oleochemicals player – also believes that while Malaysia's oleochemicals industry will continue to grow, Indonesia will grow much faster. This is not surprising considering Indonesia's output of palm oil by 2020 will be around 40-mt – double of Malaysia's likely output.

Mr. Feng sees global demand for fatty acids growing at 4% annually for this decade, with some countries like India expected to grow faster (at about 7% per annum). South East Asia is expected to reinforce its presence as the production hub for oleochemicals based on palm based fatty acids and markets in Europe and the US will be supplied by a combination of tallow and palm-based material from this region.

Ownership changes

Mr. Cheah not just sees South East Asia as the epicenter of the global oleochemicals business, but also expects companies from the region owning more and more of western assets. The oleochemicals business has already seen the exit of well-known western companies such as Croda, Cognis and P&G from fatty acids. "The bigger players are getting bigger," he adds. Small sized fatty acid producers, in particular, will feel the squeeze.

Mr. Feng agrees that ownership change is taking place in the business: the exit of traditional soapers from the business was followed by the well-known surfactant producers and is now leading to a dominance of vertically integrated raw material based companies.

Ms. Gillian Morris, at Kline & Company, a consultancy, sees the move of Western companies to divest their oleochemical operations as a strategic move to focus investment and growth on higher value downstream opportunities such as specialty surfactants.

INDIAN MARKET

'Potential to set up at least two new LAB plants by 2022'

India will need at least two new world-scale linear alkyl benzene (LAB) plants by 2022, if it is to meet its requirements for this key detergent raw material. Although supply and demand are currently evenly matched – from years of surplus that was exported – the growth in the marketplace will send the markets into deficits which will need new investments or will have to be met by imports.

According to Mr. Mathew George, Senior Manager, Petrochemicals Marketing, Indian Oil Corporation, by 2018, the LAB deficit in India will be about 130-kt and will climb further. "LAB plant capacity expansions are needed by 2013, and are best done in integrated projects with assured supplies of raw materials – benzene, n-paraffins and kerosene. Availability of n-paraffins has been a constraint for non-integrated producers in the past," he says.

No new plants

While IOC is likely to debottleneck its plant at the Vadodara refinery in Gujarat by another 40-ktpa in about three years, no other plants are on the cards. "We are examining a green-field plant in the East, but the hurdle rates are a problem, given the build-up of capacity in the Middle East. We will probably go slow on this project," he says.

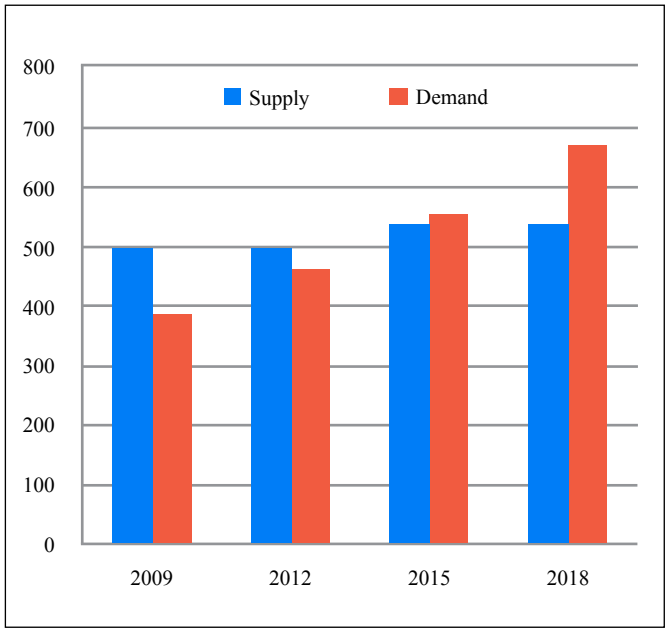

Fig. 1: India's LAB supply-demand scenario [Kilotonnes]

Source: Indian Oil Corporation

LAB project investments, he adds, will also be hard to justify especially at times when margins on the jet fuels business – which competes for the kerosene feedstock – is good.

Table 1
LAB application in India

Application	Share [%]
Consumer cleaning products	96.2
☛ Synthetic detergents for fabric wash	90.1
Popular	68.3
Mid-price	13.3
Premium	18.4
☛ Scouring products	8.7
☛ Liquid detergents	1.2
Industrial & institutional cleaners	1.3
Other industrial applications	2.5
Non-surfactant applications [varnish/cable fluid oil, lubricant]	0.1
Total	**100.0**

Source: Indian Oil Corporation

Bright growth prospects

On the market front, Mr. George sees bright prospects for LAB demand in India, especially from the lower end of the detergent market that accounts for 68% of the total market and is extremely price sensitive. "While consumption of LAB by some of the local companies is decreasing as they lose market-share, consumption by national players and multinational companies is on the rise," he says. There has been a steady increase in production of 96% LABS over the currently preferred 90% LABS, with an increase in sulphonation and detergent manufacturing facilities in the northern region.

CLEAN AND GREEN

Growing environmental awareness driving demand for speciality surfactants

Increasing awareness for the environment is an important driver of surfactant consumption, driving not just demand for oleochemical-based surfactants vs. their petrochemical based alternates, but also supporting the development of many exotic chemistries and speciality surfactants.

Particularly in personal care there seems to be a preference for natural surfactants. According to Ms. Gillian Morris, from Kline & Company, a consultancy, the markets for natural personal care products is a $10-15-bn business – small in relation to the whole personal care business, but one in which products come in at a high price premium even at a performance discount.

Specialty surfactants are used to enhance the performance of commodity surfactants and provide marketable performance benefits to the products in which they are used – reduce skin and eye irritation, provides rich foam, provides a cosmetically elegant skin or hair feel, among others. In rinse-off skin care products, for example, speciality surfactants account for almost 55% of all ingredients, while their level of usage in rinse off hair care products is only slightly lower at 35%, according to estimates made by Kline. "Rinse-offs are where the bulk of speciality surfactants are used and their growth prospects tend to be more predictable," says Ms. Morris.

Table 1
Types of speciality surfactants

Anionic	Amphoteric	Cationic	Nonionic
Ether carboxylates	Amphoteric acetates	Amine oxide	Alkyl polyglucosides
Acylisethionates	Betaines and sultaines		
Phosphate esters			
Sarcosinates			
Sulfosuccinates			
Taurates			

Kline estimates the global market for specialty surfactants for personal care at more than US$800-mn in 2010, with China leading growth.

Nascent Indian markets to see strong growth

According to Mr. Yogesh Kalra, Galaxy Surfactants Ltd., a leading speciality surfactants producer in India, the Indian personal and home care markets offer significant opportunities to grow the nascent business of speciality surfactants. "The growing aspirations and affluence across income levels, the launch of international brands across categories, the increasing share of organised retail and the steady shift from need-based to lifestyle products, are some of the key drivers," he says.

Mr. Vivek Sirohi, Vice-President – R&D, South Asia, Unilever, believes that the personal care industry is not about numbers, but about delivering value. "New sets of customers are coming into the market, including men and consumers aged 60+ with money in the pocket," he adds.

As of now, per capita consumption levels of most of personal care products are still abysmally low – indicative of the market potential – but market expansions is coming from unexpected quarters. In hair care, specifically shampoos, the growth has come from a packaging revolution with the avail-

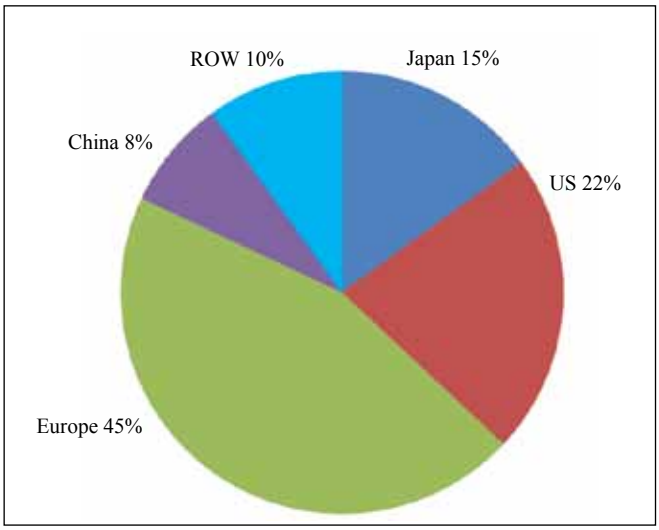

Fig. 1: Speciality surfactants market by region [2010]

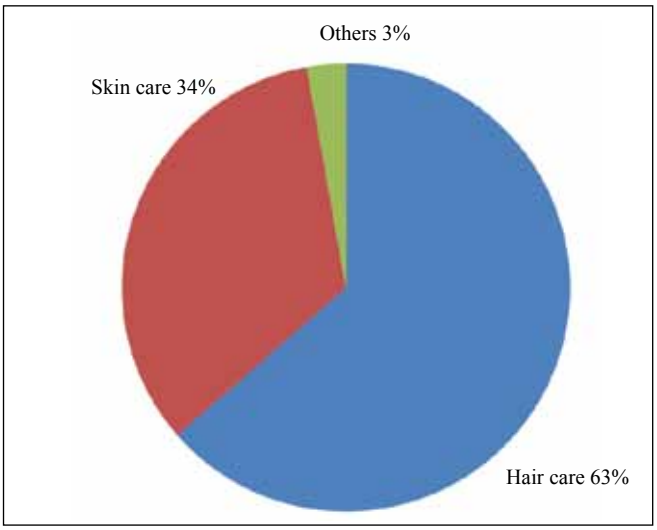

Fig. 2: Speciality surfactants market by application [2010]

Source: Kline & Co.

ability of even premium shampoos in sachets. At the same time, a small market for standalone conditioners is also emerging.

In the oral care segment while sodium lauryl sulphate is the main surfactant in use, opportunities for milder surfactants are also emerging. Likewise, ethoxylates are now a significant surfactant for fabric care, and sodium lauryl ether sulphate & betaines are emerging as viable options in dishwashing products – even though LABS continues to hold sway on both these two market segments.

In skin care, while fatty alcohol ether sulphates and betaines are the key surfactant system currently in use, there is an increasing trend towards use of mild surfactants in face and hand wash.

Mr. Sirohi however believes that unlike the household care space, where there has been a tremendous destruction of value across the value chain due to commoditization of products, the personal care space is different and still retains value. "Private labels have not been able to make as big a dent as has happened in the laundry and home care segments. This is because usage of personal care products is more intimate, unlike homecare where customers tend to be more detached."

NEW OPPORTUNITIES

Novel technologies offer hope for broadening raw material options for surfactants

Innovative and technology-driven companies, especially from the US, are eyeing the opportunities in the surfactant value chain by offering alternate raw materials that are produced by tinkering with genes or by using novel chemistries to turn low value feedstock to higher value products that can be valorized by the surfactant and other industries.

Surfactant raw materials from algae

Solazyme, a biotech start-up in the US, for example, is pioneering development of algal strains that can produce oils that have fatty acid compositions akin to the highly desirable oils, or even more exactly tailored ones with shorter chain lengths that natural algae do not normally produce.

The choice of algae to produce oils is appropriate: these microscopic organisms are amongst the most prolific producers of oils and genetic engineering has allowed creation of special strains

that grow in the dark to produce oils at a scale that allows for industrial scale operation.

According to Mr. Tim Dummer, Solazyme, the company has been able to achieve oil yields of up to 80%, compared to single digit or 20-30% at best achieved by open-pond cultivation or in photo-bioreactors. "We can fundamentally engineer new products in a matter of months. Chain length distribution and saturation levels can be modified," adds Mr. Dummer.

Stacking of traits also allows production of oils that are equivalent to palm oil, PKO or even lard. "The PKO equivalent that we have produced is very similar to natural CNO and we have done trials with chemical companies and surfactant producers. The feedback is that these oils are drop-in replacements to natural products in terms of functionality," he adds.

Solazyme is now working to produce oils with 80-90% of the highly desirable C12/C14 chain lengths and for improving feedstock flexibility to include cellulosic sugars. By 2013, the company plans to build a 100-ktpa plant in Brazil in a joint venture with Bunge, and for scaling this up further.

Snipping and stitching

In another approach, Elevance, another start-up, is using metathesis reactions (that snip and stitch together carbon chains) to convert commonly available oils (e.g. palm oils) to produce detergent range of raw materials and olefins that can substitute n-paraffins for LAB.

According to Andy Shafer, Executive Vice-President, Elavance, the technology can be adopted to a broad range of feedstock be it rapeseed, soya oils, canola or palm and produces three key product streams:

- Speciality chemicals including novel di-functional products with the functionality of oleochemicals and petrochemicals in one molecule;
- Alpha- and internal-olefins in chain lengths varying from C10 to C18; and
- Oleochemicals with a high distribution of C10 and C12 chain lengths.

The technology, in short, converts standard commodity vegetable oils – in contrast to smaller volume CNO and PKO – to produce detergent range of products. "The technology enables localization of feedstocks to use what is locally available, shortening supply chains, and reducing potential tariff burdens." This first commercial plant, with a capacity of 180-tpa, is being built in Indonesia, in a joint venture with the Wilmar group, and the second one with a capacity of 270-ktpa is being built in Natchez (MS, USA). While the first facility is expected to be online in H1 2012, the second is likely to come on-stream in 2013.

According to Mr. Shafer, Wilmar will be taking the oleochemical stream, while Elevance will market the C10/C12 esters coming from the plant.

MES – an emerging option?

At the same time, the growth in the biodiesel industry is offering a rich source of surfactant raw material – methyl esters – which can sulphonated and/or ethoxylated and then used as a substitute for LABS or fatty alcohol ethoxylates.

MES has been around for some time now, but its commercial availability in the Asia-Pacific region has improved significantly with the commissioning of a new plant for MES granules in Malaysia in 2010.

According to Mr. Tsuneharu Mukaiyama, Lion Eco Chemicals (Malaysia), while MES is comparable in performance to LABS, it has the advantage of contributing to both cost savings and for enhancing the sustainability of the detergents industry. "MES has the potential to be one of the global standard surfactants and reach a demand of 1-mt in 2020. The product can be blended in existing detergent formulations in any ratio."

With these options emerging, the raw material options for the surfactant industry can only get better.