The changing face of the surfactant supply chain

Consultant Neil A. Burns overviews the major trends in an evolving industry

The $30 billion, 15 million tonnes/year surfactants market supports end-use consumer and industrial markets worth over $1 trillion. Among the larger markets in which surfactants play a critical role are household cleaning ($250 billion/year), industrial and institutional cleaning ($50 billion), cosmetics and personal care ($300 billion), adjuvants and pesticides ($60 billion), off-field chemicals ($86 billion) and paints and coatings ($130 billion).

This article will discuss the changing face of the surfactant supply chain. In particular, it will address the downstream integration of South-East Asian palm plantation companies into surfactant production, while also looking at the very different states of the market in different global regions and the pressures exerted by consumer markets, then at what participants should do to ensure that the industry’s reputation reflects the fundamental benefits it brings to the global economy.

Downstream integration

Vertical integration, primarily downstream by palm plantation companies, continues to be the most significant and disruptive force at work in the surfactant value chain today. The drivers of vertical integration in surfactants are no different to those in many other industries. In the 20th century and in the nascent surfactants industry, BASF has made use of both vertical and horizontal integration as a key part of its strategy.

In recent business thinking, a number of theories have been promulgated as to what drives vertical integration. These include tax policy, monopoly seeking, scale, scope and, my personal favorite, the dramatically named ‘hold-up problem’, which has been further elucidated as a “an extreme example of transaction cost economics”.

The latter is particularly relevant to the recent examples of companies like KLK, Wilmar, Musim Mas and, most recently, Sinar Mas integrating downstream into the production of detergent range alcohols and further into anionic (in the case of KLK and Wilmar) and non-ionic (for the same two plus Musim Mas) surfactants.

A surfactant-themed version of the hold-up problem goes like this. A company — let’s call it the Worldwide Widget Group (WWG) — decides to diversify into the alcohol business by building a plant which takes palm kernel oil as a feedstock. It plans to sell the product to major ethoxylators and sulfonators, who in turn sell the product to the big consumer product groups (CPGs) like P&G, Unilever and Henkel.

As part of its market research, WWG talks to the top three ethoxylators and sulfonators in its region. They all tell WWG, yes, go ahead, we will buy your output as there is a real need in the market and prices are quite high, really. However, once the plant is built, these same customers tell it that demand is not so great as it was. In fact, prices are off by at least 25% from what they told it a year or so ago.

There goes WWG’s business plan and return on investment (ROI)! What choice does WWG have? It has built the plant already. It cannot simply not run the plant. This is a hold-up! In fact, WWG does have a choice in that it can acquire one or more of its customers or can just invest further downstream and sell directly to the CPGs themselves.

Similar logic can apply at multiple points on the supply chain. Some examples of the recent vertical integration of Southeast Asian companies downstream include KLK, Wilmar, Musim Mas, Sinar Mas, Sime Darby and Ecogreen (Table 1).

KLK has over 100 years in the palm plantations and related businesses. After moving one step

<table>
<thead>
<tr>
<th>Company</th>
<th>Downstream Investment</th>
<th>Location</th>
<th>Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wilmar</td>
<td>New capacity fatty alcohol</td>
<td>Rotterdam, Netherlands (on Huntsman site)</td>
<td>Lauryl, cetyl, stearyl alcohols &amp; 8-10 acids</td>
</tr>
<tr>
<td>Wilmar</td>
<td>Acquisition of Huntsman European surfactant business</td>
<td>Lavena &amp; St. Mihel, France, Castiglione, Italy</td>
<td>LAS, SLES, SLS &amp; detergent ethoxylates</td>
</tr>
<tr>
<td>Wilmar</td>
<td>Joint venture with Elevance on metathesis plant</td>
<td>Surabaya, Indonesia</td>
<td>Renewable cliens, dioctane &amp; other intermediates</td>
</tr>
<tr>
<td>Musim Mas</td>
<td>New capacity for fatty alcohol</td>
<td>Medan, Indonesia</td>
<td>Lauryl, cetyl, stearyl alcohols &amp; 8-10 acids</td>
</tr>
<tr>
<td>Musim Mas</td>
<td>New capacity ethoxylation</td>
<td>Terneuzen, Netherlands (next to Dow EC)</td>
<td>Detergent ethoxylates</td>
</tr>
<tr>
<td>Sinar Mas</td>
<td>Joint venture with CEPSA</td>
<td>Dumai, Sumatra Indonesia</td>
<td>Lauryl, cetyl, stearyl alcohols &amp; 8-10 acids</td>
</tr>
<tr>
<td>Sinar Mas</td>
<td>CEPSA/Sinar Mas joint venture acquires Gemini Holdings sulfonation plant (formerly a Hansa Group asset)</td>
<td>Genthin, Germany</td>
<td>LAS, SLES &amp; SLS</td>
</tr>
<tr>
<td>Sime Darby</td>
<td>Joint ownership of Emery Oleochemicals with PTT of Thailand</td>
<td>Batam, Indonesia, Singapore, St-Pierre-les-Elbeuf, France</td>
<td>Fatty acids, alcohols, MES, sulfonates &amp; sulfates</td>
</tr>
<tr>
<td>Ecogreen</td>
<td>New fatty alcohol capacity and acquired sulfonation assets in France (former Wilco), ethoxylation</td>
<td>Westoort, Malaysia</td>
<td>Fatty alcohols, detergent alcohols, LAS, SLS &amp; SLES</td>
</tr>
<tr>
<td>KLK</td>
<td>New capacity for fatty alcohol</td>
<td>Ougrée Belgium</td>
<td>LAS, SLS, SLES</td>
</tr>
<tr>
<td>KLK</td>
<td>Acquisition of Tansachem</td>
<td>Moerdijk, Netherlands &amp; Hedingen, Switzerland</td>
<td>Ethoxylates</td>
</tr>
</tbody>
</table>

Table 1 – Recent & planned downstream investments by palm oil companies
downstream into fatty acids, it got into the alcohol business in early part of the 2000s, then quickly expanded into methyl ester sulfonates and then further downstream from alcohols into ethoxylates (via the acquisition of Kolb, the Swiss-headquartered surfactant company) and more recently the into sulfonates by acquiring Tensachem in Belgium.

As KLK bolstered its position downstream, meanwhile, Croda deliberately divested itself of fatty acids assets, thereby reducing its level of vertical integration and focusing intently on a strategy of adding application value at the front end of its value chain. Table 2 lists KLK’s oleochemical assets, highlighting those acquired from Croda.

It is easy enough to chronicle what is happening but what, if anything, can we learn and is vertical integration really a moneymaker for surfactant companies and their shareholders? To answer that question we need to compare the profitability of non-integrated companies with the same metrics for integrated ones. The problem immediately presents itself of how do you truly get at the profitability of the surfactant part of a vertically integrated business. What is the transfer pricing like? At what value are the assets carried? How do you split the overhead? How much of the share price movement is driven by the surfactant business in the larger whole.

Croda, one of my favorite examples of a strategically consistent surfactant company, has relentlessly executed against its vision of what vertical integration should look like. Over the past decade or so, the company, which is a large user of fatty acids has steadily divested its fatty acid production capacity in North America (from its predecessor Uniqema to HIG, and in Europe and Malaysia (both to KLK).

Croda is happy to focus and invest in the front end of the value chain in applications technology. Recently, it has gone further back up the supply chain with the construction of the first new ethylene oxide (EO) and ethoxylates manufacturing capacity in North America in many years.

The Croda wrinkle on this is that it is bio-EO, derived from ethanol. However, I doubt that Croda has changed its mind on vertical integration. More likely, it would not have done this without the ‘bio’ angle, although the logistics advantages for a company ethoxylating in the North-East US and not on an EO pipeline have also got to be worth something.

Today’s poster boys for vertical integration are, of course, the palm plantations moving steadily downstream from the palm tree. Internal cost accounting has various ways of treating the various stages of the supply chain inside such a business.

Could the palm plantation business be used as an elastic or ‘shock absorber’ to dampen volatility that might affect the smaller downstream businesses in fatty alcohols and surfactants? Can these integrated producers thus compete better (i.e. withstand lower prices for longer) against their non-integrated counterparts? Are they able to avoid the infamous “hold-up problem”?

I think, from empirical observation, the answer is yes. They compete better, but are they more profitable? I do not know. Are these newly vertically integrated companies, marking to market and setting transfer prices appropriately? Are assets re-valued and ROIs benchmarked at defined intervals along the value chain?

How do the palm companies compare with, say, Shell Chemical in these internal accounting practices? Again, I do not know, but I could argue that the systems at Shell have had more time to mature over the time that Shell’s vertically integrated Noordol ethoxylate business has existed.

Vertical integration, like any other business strategy, can be done well or poorly and does not exist in a vacuum. For Croda, it did not work except in a differentiated way where there was also a clear inefficiency in the supply chain. For the palm plantations, it works today and some non-integrated companies are feeling some intolerable competitive pressure – and experiencing the occasional hold-up – as a result.

In the long run, could the shelter provided by their resource-rich parents lead to some of these integrated companies getting fat and lazy and not earning a decent return on their invested capital? Probably.

Consolidation & fragmentation

For a supposedly mature and global business, local conditions in the surfactant supply chain are radically different between regions, even in the developed markets. North America’s surfactant landscape has consolidated markedly over the last 20 years, whereas Europe has not consolidated at all and has even arguably become more fragmented with new players investing.

In North America, such major producers and marketers of anionics as Sun Products, Unilever, Colgate and Dial (now Henkel) have long since shuttered capacity, outsourced (usually to Stepan) or retreated from the merchant market. Figure 1 compares the competitive intensity of the sulfonated surfactant markets in North America and Europe by plotting cumulative capacity by company for the merchant market.

In Europe, it seems that, just as with airlines, every country still seems to need its own surfactant manufacturer, despite any notions of a single market supporting economies of scale. In North America, consolidation has proceeded steadily resulting in a less competitive, more profitable industry for the remaining participants.

A clear illustration of the greater profitability of the North American surfactant industry is shown in Stepan’s annual reports, which provides the gross margins earned in different parts of the world. Figure 2 shows how margins from the surfactants segment have varied over the past

### Table 2 – KLK’s oleochemical assets

<table>
<thead>
<tr>
<th>KLK/oleo Plants Only</th>
<th>Location</th>
<th>Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Palm-Oleo</td>
<td>Rawang, Malaysia</td>
<td>Fatty acids &amp; glycerine</td>
</tr>
<tr>
<td>KSP Manufacturing</td>
<td>Rawang, Malaysia</td>
<td>Soap noodles</td>
</tr>
<tr>
<td>Palmamide</td>
<td>Rawang Malaysia</td>
<td>Fatty acids, bis-amides, alkanolamides</td>
</tr>
<tr>
<td>Palm-Oleo</td>
<td>Klang, Malaysia</td>
<td>Fatty acids, glycerine, soap noodles, fatty esters</td>
</tr>
<tr>
<td>KLK-Oleomass</td>
<td>Westport, Malaysia</td>
<td>Fatty alcohols, methyl esters</td>
</tr>
<tr>
<td>KLK Bioenergy</td>
<td>Shah Alam, Malaysia</td>
<td>Biodiesel</td>
</tr>
<tr>
<td>Davos Life Science</td>
<td>Malaysia</td>
<td>Fatty acids, tocotrienol</td>
</tr>
<tr>
<td>KLK Dumai</td>
<td>Dumai Indonesia</td>
<td>Fatty acids</td>
</tr>
<tr>
<td>Taiko Palm Oleo</td>
<td>Zhangjiagang, China</td>
<td>Fatty acids, soap noodles &amp; base, triacetin</td>
</tr>
<tr>
<td>Shanghai Jinshan</td>
<td>Changhai, China</td>
<td>Amines, esters, surfactants</td>
</tr>
<tr>
<td>KLK Emmerich</td>
<td>Emmerich, Germany</td>
<td>Fatty acids, &amp; glycerine</td>
</tr>
<tr>
<td>Kolb</td>
<td>Hedingen, Switzerland</td>
<td>Alkoxylated surfactants</td>
</tr>
<tr>
<td>Kolb</td>
<td>Moerdijk, Netherlands</td>
<td>Alkoxylated surfactants</td>
</tr>
<tr>
<td>Tensachem</td>
<td>Cugree, Belgium</td>
<td>Anionic surfactants</td>
</tr>
</tbody>
</table>

Figure 1 – North American (a) & European (b) sulfonation capacity (000 tonnes/year)
few years between North America and Europe. 2014 included some extraordinary expenses in North America but the pattern is clear.

The drivers of consolidation are similar in some respects to the drivers of vertical integration and include scale and scope as well as cost synergies. The much-touted ‘rule of the market’ has clearly made itself felt in North America as companies have merged and significant capacity, as well as cost overhead, has been taken out as a result.

The most significant recent development in the North American market occurred in July 2015 when Stepan announced the purchase of Sun Products’ sulfonation capacity in Pasadena, Texas. Stepan will supply Sun with the products it previously made in Pasadena out of existing Stepan capacity. The site will be decommissioned and some equipment may be moved to Stepan sites.

This move follows the February 2014 closure of Sun Products’ Baltimore site, which included significant sulfonation capacity. No specific supply arrangements were noted, but one can safely assume that most if not all of the linear alkylbenzene sulfonate (LAS) made there was subsequently sourced from Stepan.

The story of surfactants in Latin America continues to feature Oxiteno, a business of Grupo Ultra and the biggest EO manufacturer in the region. It also continues to be a story of a protected industry. The import duty on non-ionic surfactants into Brazil is 14%, compared to 4% for Germany and the rest of the EU, 4% for the US and a 6.9% global average.

Despite a monopoly position in EO in Brazil and high tariff barriers, Oxiteno suffers from having only one supplier, Braskem, for its key feedstock, ethylene. In addition, Brazil continues to attract foreign suppliers seeking to overcome tariff barriers by manufacturing there. These suppliers include Stepan, which acquired from P&G, CEPISA (with sulfonation and linear alkylbenzene manufacturing), Evonik and Lubrizol (both specialty surfactants).

The Asian surfactants market looks like the US in the 1960s – fragmented, growing, overinvested and open to innovation, especially with respect to costs. The one mature market pocket, Japan, is subject to the same sclerotic growth that plagues Europe and one could argue that consolidation is long overdue. In China, state-mandated consolidation is likely to continue in surfactant-related businesses, especially EO and ethoxylate, much as it has done in other areas, such as silicones and silanes.

**Consumer markets**

About 75% of the volume of surfactants ends up in cleaning applications and most of this is purchased by consumers. Therefore what consumers think and how they act is key for the industry. Again, this is more correctly the subject of an entire paper, but here are a few key points and some myths that need debunking.

The idea that ‘Consumers won’t pay more for X’ where X is green or renewable or ethical is simply not true. Some consumers will pay more, even for interior products in terms of performance. A segment of the market pays more for 7th Generation’s detergent than they could for Tide because of 7th Generation’s green record.

There are groups of consumers, especially in Western markets that are sufficient to sustain companies like Wholefoods (despite being short-changed!), Tesla (just about) and Ecover (an outstanding company that does walk the talk, in my view). These segments are small compared to the mass market, but they deserve attention and the appropriate response from producers and formulators.

It is true that consumers are increasingly interested in ‘what’s in there’, although, again, this is a certain vocal segment. Companies are responding rightly to this interest, while balancing a need for trade secret protection.

Product ingredient labelling has been the norm in cosmetics and personal care for decades. Whatever controversy surrounded this listing requirement has long since disappeared and the industry seems not to have suffered unduly. Similar disclosure is on its way in the household sector where I predict that thought leaders like S.C. Johnson will pull others along in their wake.

In the cosmetics sector, the next frontier is fragrance ingredient disclosure where the industry trade association has been wrestling with for at least five years. Again S.C. Johnson is blazing a trail here and in the household sector.

By disclosing ‘what’s in there’, however, is only part of the story and, for the general public, is not particularly informative. People want to know the provenance and purpose of the ingredients (i.e. where they come from and what they do). In the case of surfactants, this is an opportunity for formulators and manufacturers to make a compelling case for themselves and the products.

Of course in any such marketing communication, there are going to be winners and losers. The ‘sulfate-free’ shampoo product segment is well established and populated by companies such as L’Oreal and consumers who want this can find it.

There is a risk of straying into somewhat disingenuous territory where some companies will assert that sodium lauryl sulfate (SLS) is very bad for you and so they don’t use it – they use sodium coco sulfate instead. That minor variation in C12, C10, C8 and C6 chain length distributions around the core C12-14 (lauryl) content makes all the difference between lauryl and coco, right? Baloney! If you truly think SLS is bad, don’t use it, but don’t commit nomenclature slight of hand in the process.

It is sometimes said that ‘you just can’t win’ or ‘no good deed goes unpunished’. Last year at the 4th COS European Surfactant Conference, Ecover told a story about how it wanted to eliminate palm oil in the soap used in its laundry detergent. This was done to address the customer segment for whom animal-free was no longer enough and who sought to avoid palm because of concerns about the deforestation practices of palm plantations.

So, Ecover worked with Solrazyme to use Solrazyme’s algal oil to make a soap, which was flaked and formulated into the detergent. Solrazyme uses genetically engineered microalgae to ferment sugar into oil. No sooner had the product hit the supermarkets than Greenpeace & al. slammed Ecover for using GMOs in it, no matter that the algae was not actually in the product.

The public shaming became so intense that Ecover, the company which had so nicely occupied this market segment, withdrew the product from the European market. To Ecover’s credit, it talked about this episode publicly and openly to illustrate the company learning process it went through as a result of the experience.

Overall, as a surfactant maker, your customer’s (P&G) customer’s (Walmart) customer (the public) is also your customer. I would caution companies, however, against over-reacting and being whipsawed or paralysed as a result.

Be clear-eyed about the size and influence of the segments involved and the extent to which their needs filter back through the supply chain to you. LAS is not going to be banned or even phased out, not even in Denmark. Other products will be phased out, eventually, for example nonylphenol ethoxylates, but the process is slow. This is the surfactants industry, not consumer electronics.

**Industry reputation**

Like the chemical industry overall, the surfactant industry has come under some...
criticism, much of it ill-informed and undeserved.
In talks at CESSIO and the World Surfactant Conference in 2014 and 2015, I developed a theme that I finally published in an open letter to the surfactant industry a few months ago.9

The key point was that compared with some other industries, like Pepsi and Coca-Cola the surfactant industry supports genuine social and economic progress. Were these companies to disappear, nothing would happen, except that society might be a bit healthier. If BASF or Solvay were to disappear, along with the whole surfactant industry, it would be lights out for civilisation, quite literally.

I would encourage you to look at some of the publications from Greenpeace, EDF, The Indispensant and other sources that I discussed at CESSIO last year. Invoking against ‘contamination of the child’, as Greenpeace does, is guaranteed to tug at the heartstrings, but there is another side to the story.

When surfactant-assisted handwashing was introduced by Ignaz Semmelweis in Budapest in the late 19th century, mortality at childbirth was cut immediately by five sixths. Without the surfactant-assisted agricultural adjuvant industry, pesticides would not be able to do their jobs and 7.2 billion people would find it more difficult, time-consuming and expensive to feed themselves. Some would starve.

The reputation of the surfactant value chain has massive upside potential. If individual members like you and I speak passionately about the good that our companies do in society, the environment will improve for all of us and give us room for more innovation and growth.

Conclusion

While ‘mature’ in a number of markets, our surfactant industry is anything but boring and remains essential to human life and progress. As vertical integration plays out, we will see large palm-based companies growing to rival their petrochemical cousins, Sasol and BASF, in global reach and scale.

Consolidation via M&A will assist this trend. Even in Europe, something will give and consolidation will contribute to a clearing out of obsolete capacity and marginal players. Many of us in will find ourselves working for large multinationals that we had barely heard of a few years ago.

Consumers will increasingly look back up the supply chain and influence the surfactant manufacturers and their feedstock suppliers. Remember that these consumers are our friends and family, and talk to them as such, in an enthusiastic and open way.

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