Jason Dearden-Watts, James Hodgkinson – Surfachem, UK

Hair care devolution: naturally back to basics

The UK hair care market for shampoos and conditioners is currently undergoing a renaissance. After weathering a period of recession between 2006 and 2009 it has since grown at over 3% per annum and is currently valued at £814 million. This growth shows no signs of decreasing and the market is expected to be worth close to £1 bn by the end of the decade.[1]

The UK hair care market is dominated by Proctor and Gamble, Unilever and L'Oréal with a combined market share of over 70% in 2012.[1] In 2013 just 5% of shampoos and conditioners launched globally were specifically targeted at men, despite this demographic having high usage.[2] Botanical and herbal ingredients are extremely popular, appearing in 58% of all shampoos and conditioners launched in the year prior to March 2014.[2] The origin of botanical ingredients varies significantly by region and domestic companies prominently incorporate locally sourced ingredients to give them an edge over multinationals.

Naturally back to basics

Despite significant growth, the hair care market is becoming overly complicated and confusing for both consumers and formulators. The labelling claims desired and increasingly demanded by consumers are beginning to significantly restrict the ingredients available to formulators. These claims include but are not limited to:

- Free from sulphates/SLES (sodium laureth sulphate)/SLS (sodium lauryl sulphate)
- PEG (polyethylene glycol) free

- Preservative restrictions on parabens, MIT/CIT, formaldehyde donors and phenoxyethanol
- Natural and/or organic
- Chemical free.

In response, Surfachem's Technical Development Team embarked on a hair care campaign with the aim of developing simple formulations for shampoos and conditioners that address these claims without having a significant impact on cost or performance. Materials with natural derivation and accreditations were used preferentially where possible.

Shampoo

Everyday shampoo has traditionally been one of the easiest of applications to develop and manufacture. A classic combination of sodium laureth sulphate (SLES), cocamidopropyl betaine and cocamide DEA is still widely used due to its cost effectiveness and flexibility. However both SLES and cocamide DEA are ingredients that, for various reasons, have fallen out of favour with consumers and consequently formulators.

Surfachem are frequently asked how to replace these key materials and there is a wide and growing range of alternatives. These alternatives however do generally tend to be more costly while critical properties like foam performance and viscosity are more difficult to achieve.

At Surfachem we have developed our own base formulation, Shampoo Base DFL0020, which provides good foaming and viscosity while remaining flexible enough to easily allow the incorporation of additional materials that can provide supplementary claims.

DFL0020 uses a combination of three surfactants, sodium lauryl sulfosuccinate (REWOPOL SBF 12P), cocamidopropyl betaine (Tego Betaine F 50) and sodium lauroyl sarcosinate (Surfacare L30).

Optional modifiers can be easily incorporated into DFL0020 to get additional claims including, heat protection, 2:1 conditioning, and colour protection which are discussed in further detail below. Furthermore the total surfactant concentration can be decreased to reduce cost without a decrease in foaming or cleaning when used in combination with a carbomer (Carbopol Silk 100).

Conditioner

Conditioner plays a pivotal role in improving the texture and appearance of hair while simultaneously making it more manageable and easier to handle. Surfachem's new conditioner base DFL0009 has been designed to give a luxurious feel in a formulation that is cost effective and easy to produce. Based on distearoylethyl dimonium chloride & cetearyl alcohol (Varisoft EQ 65) the formulation is natural and suitable for Cosmos certification.

As with shampoo base DFL0020, conditioner base DFL0009 was developed with flexibility as a key attribute. The labelling claims, viscosity and cost can be easily varied by changing the ratios and addition levels of each component without a significant impact on performance or stability.

Optional modifiers

The primary objective of shampoo base DFL0020 and conditioner base DFL0009 was to concentrate on avoiding the ingredients that consumers do not want in their formulations. But what about

the ingredients and/or properties that are desired?

Labels do not just need to indicate what is not in consumer goods; they also need to sell the formula's attributes and benefits. The flexibility and stability of shampoo base DFL0020 and conditioner base DFL0009 allow for the inclusion of a wide range of supplementary ingredients that can provide additional benefits. These supplementary ingredients can be very easily incorporated without affecting the overall performance of the base.

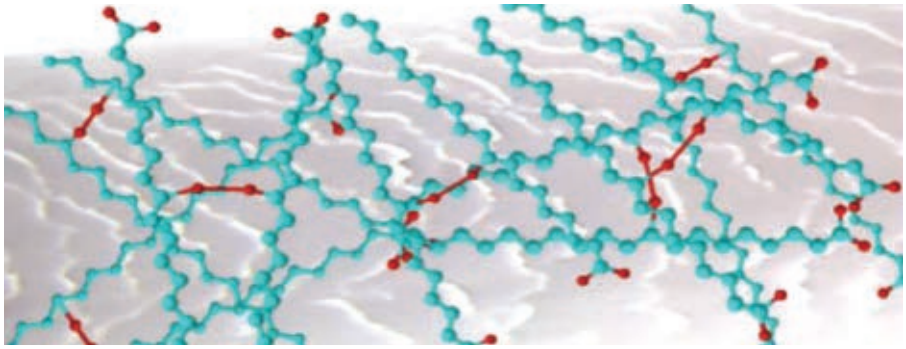

Figure 1: *Mongongo oils creates a protective film around hair fibres.*[3]

Heat and environmental protection

Heat from driers, straighteners or curlers has a damaging effect on our hair. Incorporating materials that protect the hair fibres into every day products like shampoos or conditioners is an efficient and effective way to reduce the stress.

Ubuntu Mongongo oil from Aldivia is a naturally-sourced African nut oil that has the ability to protect the hair from heat and everyday environmental stress.

The molecular composition of mongongo oil is the secret behind its effectiveness. Mongongo oil contains between 20% and 32% α-eleostearic acid, a molecule that contains a series of three conjugated double bonds. When subjected to extremes of heat or light and in the presence of oxygen these double bonds react, forming a reticulated oxopolymer that acts as a protective film. The reticulated film not only protects the hair but acts to level the surface of the hair increasing the gloss and shine.

Colour protection

Exposure to UV radiation from the sun causes hair colour to fade or dull. This is particularly undesirable in dyed hair where long lasting vibrant colours are highly sought after by consumers. Polysilicone-19 (Abil UV Quat 50) is a conditioning polymer that combines the sensory benefits of a quaternary silicone polymer with the UV light absorption of a sunscreen filter.

The cationic nature of the polymer makes it substantive to the hair resulting in a residual film that absorbs UV radiation reducing the hairs exposure to light.

The incorporation of 2% polysilicone-19 leads to a reduction of colour fading by 50%. This means that the colour can resist the damaging effects of sunlight for twice as long. The conditioning effects on polysilicone-19 also provide the sensory benefits when incorporated into a shampoo or conditioner.

Volumising

Adding extra volume to hair is an excellent way to combat limp or lifeless styles. Hair treated with Methoxy PEG/PPG-7/3 aminopropyl dimethicone (Abil Soft AF 100) conditions and volumises fine hair while making it easier to comb. By only targeting damaged cuticles, Abil Soft AF 100 does not coat the hair and consequently provides a more natural look and feel. Using Abil Soft AF 100 provides significantly more volume when tested against traditional conditioning agents like cetrimonium chloride.

Methoxy PEG/PPG-7/3 aminopropyl dimethicone contains hydrophilic groups making it highly compatible in aqueous systems including shampoos. Only small quantities are required to get noticeable conditioning and volumising benefits.

Formulation 1: Shampoo.

Trade Name	Chemical
Deionised Water	Aqua
Tego Betain F 50	Cocamidopropyl Betaine
Surfacare L30	Sodium Lauroyl Sarcosinate
Rewopol SBF 12 P	Disodium Lauryl Sulfosuccinate
Surfac G995V	Glycerin
Antil HS 60	Cocamidopropyl Betaine, Glyceryl Laurate
Saliguard HDZ	Hexandiol, Propandiol, Iodopropyl Butyl Carbamate
Sodium Chloride	Sodium Chloride
Citric Acid Anhyd N1560 MED	Citric acid
Perfume	Givaudan Deodorising 70 (optional fragrance)
Tegosoft APS	PPG-11 Stearyl ether (optional solubiliser)
Glucamate VLT	PEG-120 Methyl Glucose Trioleate, Propanediol (optional)

Formulation 2: Conditioner.

Trade Name	Chemical
Deionised Water	Aqua
Varisoft EQ 65 Pellets	Distearoylethyl Dimonium Chloride & Cetearyl Alcohol
Surfac CS	Cetearyl Alcohol
Surfac G995V	Glycerin
Perfume	Givaudan Pommy
Saliguard HDZ*	1,2-Hexanediol, 1,2-Propanediol, Iodopropynyl Butyl Carbamate
JBL Citric Acid Monohydrate F6000 Fine	Citric Acid

*A natural preservative system (eg Salinatural OLG: Orange Oil, Lemon Grass Oil, Sesame Oil) would be required for 100% natural claims.

Silicone-free, two-in-one conditioning shampoo

The addition of cassia hydroxypropyl-trimonium chloride (Sensomer CT-250) to shampoo base DFL0020 is an easy and effective way to produce a silicone free 2:1 shampoo. Cassia hydroxypropyltrimonium chloride is a naturally-derived polymer derived from cassia gum. A substantive hair conditioning agent it provides improved combing and hair aesthetics even at very low addition levels. PC

References

1 Mintel Market Sizes. January 2014.
2 Category Insight: Shampoo and Conditioner. Mintel, June 2014.
3 Ubuntu Mongongo Reticulation. Aldivia, June 2012.