

# MQ resins in personal care applications

This article describes MQ resins, a series of silicone polymers that find application in many personal care formulations.

## Silicone polymers

The first concept that one needs to understand in dealing with silicone polymers is a concept called 'construction'. Specifically, construction relates to the monomers that are used to construct a

silicone polymer. The selection of the type and number of monomer types in a specific polymer will determine the structure of the polymer. The structure of the polymer in turn determines the functional properties and how the polymer will behave in formulations.

The shorthand for the construction of silicone homopolymers is shown in Figure 1.<sup>1</sup>

Knowing this shorthand, silicone polymer chemists can construct a simple description of silicone polymers. This is best shown in the case of silicone fluids.

## Silicone fluids

The most simple of the silicone fluids is what we refer to as MM, or 0.65 viscosity fluid. The structure is shown in Figure 2.

All other silicone fluids are compounds and have the construction MDnM, shown in Figure 3. While common usage calls these materials dimethicone, silicone fluids, silicone oils, the construction

shorthand is very specific as shown in Figure 4.

Table 1 shows the approximate 'n' value for dimethicone polymers commonly used in personal care formulations. It should be clear that the nomenclature MD<sub>127</sub>M is a more precise definition of a dimethicone having a viscosity of 200 centistokes than simply dimethicone, since it clearly specifies a structure and is clearly not a blend. All these attributes are lacking in the description dimethicone.

## MQ resins

MQ resins are an interesting class of materials that find increasing applications in personal care formulations. As the name implies, the two groups present in the molecule are 'M' and 'Q'. The INCI name for Q resins is trimethylsiloxyisilicate, but as we shall see, the function of this class of compounds is determined by the exact structure and not the assigned INCI name. The application in specific areas of

Figure 1: Shorthand for silicone construction.

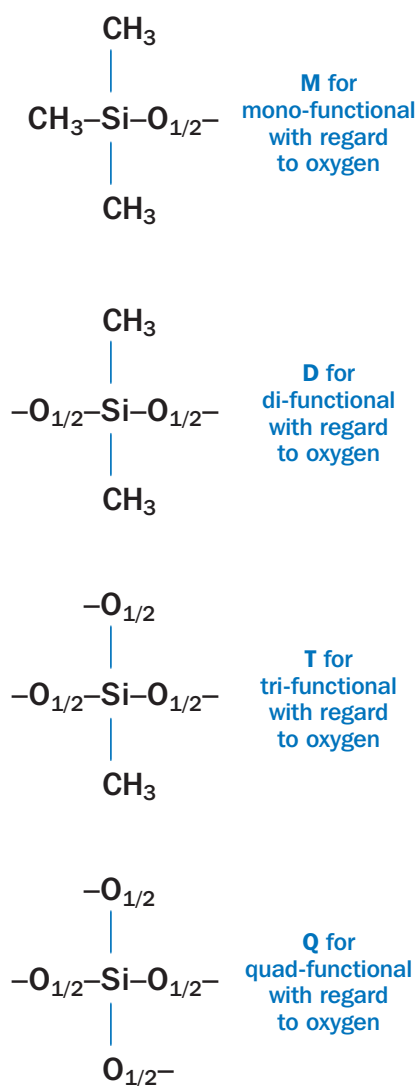


Figure 2: Shorthand MM 0.65 cst silicone fluid.

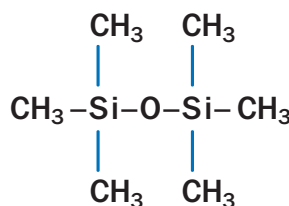


Figure 3: MDnM silicones dimethicone.

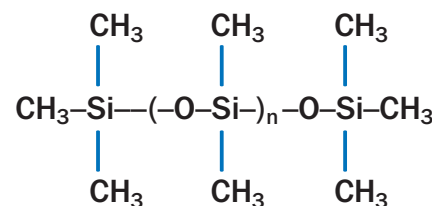
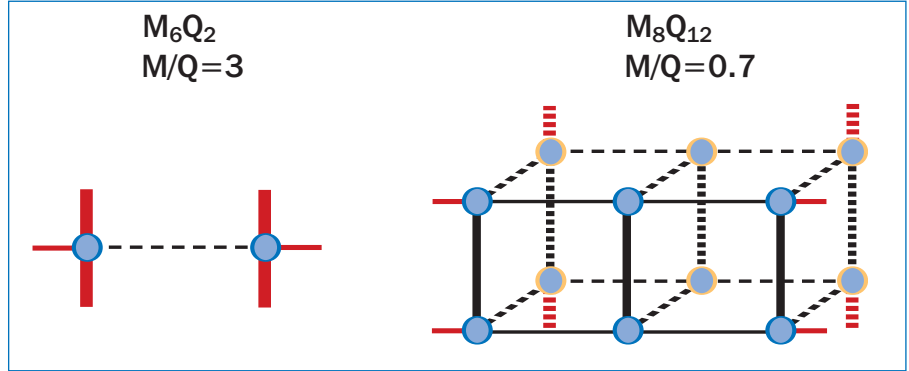
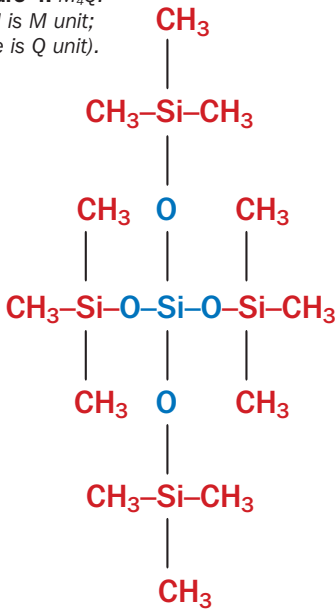


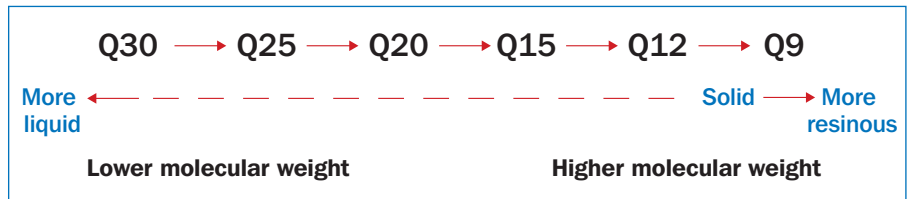
Table 1: Silicone fluids.

| Viscosity at 25 °C (centistokes) | Approximate molecular weight | Approximate 'n' value | Average construction |
|----------------------------------|------------------------------|-----------------------|----------------------|
| 5                                | 800                          | 9                     | MD <sub>9</sub> M    |
| 50                               | 3780                         | 53                    | MD <sub>53</sub> M   |
| 100                              | 6000                         | 85                    | MD <sub>85</sub> M   |
| 200                              | 9430                         | 127                   | MD <sub>127</sub> M  |
| 350                              | 13,650                       | 185                   | MD <sub>185</sub> M  |
| 500                              | 17,350                       | 230                   | MD <sub>230</sub> M  |
| 1000                             | 28,000                       | 375                   | MD <sub>375</sub> M  |
| 10,000                           | 67,700                       | 910                   | MD <sub>910</sub> M  |
| 60,000                           | 116,500                      | 1570                  | MD <sub>1570</sub> M |

**Figure 4:**  $M_4Q$ . (red is M unit; blue is Q unit).



**Figure 5:** Two MQ resin structures (red is M unit; blue is Q unit).



**Figure 6:** Properties of MQ resins evaluated.

formulation is based upon the exact structure. ‘The ratio of the M to Q units is of utmost importance’<sup>2</sup> in determining the structure and functionality.

Our shorthand for the construction would be  $M_nQ$ . The simplest compound to envision is  $M_4Q$  shown in Figure 4.

As the ratio of M to Q is decreased from 4:1, products with more complicated cubic structures are produced. Figure 5 shows two of these. The lower the M to Q ratio, the more crystalline the product, which is commonly dissolved in a solvent for ease of handling.

Clearly, there are a variety of structures for the class of compound, depending upon the M to Q ratio. MQ resins can drastically change the physical properties and feel of a cosmetic formulation. A series of six MQ resin products designed for a range of personal care applications were evaluated in a number of personal care formulations.

If the ratio of M:Q is close to 4.0:1.0 a low viscosity liquid results, which finds application in modification of surfaces improving spreading, dispersing and conditioning.

If the ratio of M:Q is close to 1.0 a solid, film forming resin results. This type of product is interesting for transfer resistance and pigment coating.

The solid MQ resins were evaluated as a 70% active product in isododecane. Figure 6 shows the properties of the products evaluated.

**Colour rich lipstick**

Each of the five lipstick formulations was identical except that the control had no MQ resin, FL503C had 3 w/w% of Silwax J219M, FL503C.1 had w/w% of Silmer Q20, FL503C.2 had 3 w/w% of Silmer

Q30, and FL503C.3 had 3 w/w% of Silmer Q25.

The addition of Silmer Q20/25/30 not only improved the stability and colour dispersion but also increased surface gloss too.

**Ideal shade foundation with and without MQ resin**

The 8 foundation formulations were identical except for the following quantities of MQ resin (the control had none): FM610D – 2 w/w% Silwax Di-1021M, FM610.1 – 8.5 w/w% Q20, FM610.2 –

8.5 w/w% Q15, FM610.3 – 8.5 w/w% Q12, FM610.4 – 8.5 w/w% Q9, FM610.5 – 8.5 w/w% Q30, FM610.6 – 8.5 w/w% Q25.

FM610.1 with Q20 is stable both at room temperature and 45°C for 7 weeks, exhibiting improved stability over the control.

**Eye shadow**

The eye shadow formulations were identical apart from the following quantities of MQ resin (the control FM616 had none and had 31 w/w% of DC 9040 while the rest had 21 w/w%): FM616 A – 10 w/w% Q20,

**Table 2: Products evaluated.**

| Product    | M:Q ratio | Activity (%) | Solvent     |
|------------|-----------|--------------|-------------|
| Silmer Q9  | 0.9:1     | 70           | isododecane |
| Silmer Q12 | 1.2:1     | 70           | isododecane |
| Silmer Q15 | 1.5:1     | 100          | None        |
| Silmer Q20 | 2:1       | 100          | None        |
| Silmer Q25 | 2.5:1     | 100          | None        |
| Silmer Q30 | 3:1       | 100          | None        |

**Table 3: Specifications for FL503 series.**

| Specifications           | FL503                         | FL503C                        | FL503.1                       | FL503.2                       | FL503.3                       |
|--------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|
| S.G.                     | 1.010                         | 1.018                         | 1.013                         | 1.018                         | 1.011                         |
| Appearance               | Poppy love Smooth bullet-like | Poppy love Smooth bullet-like | Poppy love Smooth bullet-like | Poppy love Smooth bullet-like | Poppy love Smooth bullet-like |
| Melt Point               | 50-62                         | 50-62                         | 49-61                         | 49-61                         | 49-61                         |
| Hardness                 | 56                            | 54                            | 53                            | 53                            | 53                            |
| Stability @45°C          | Good                          | Good                          | Good                          | Good                          | Good                          |
| Feel (1-10, 10 the best) | 9.1                           | 9.2                           | 9.3                           | 9.3                           | 9.3                           |
| Compatibility            | Good                          | Good                          | Good                          | Good                          | Good                          |

**Table 4: Specifications for liquid foundation.**

| Specifications           | FM610                   | FM610D<br>w/Di1021M     | FM610.1<br>w/Q20        | FM610.2<br>w/ Q15       | FM610.3<br>w/Q12        | FM610.4<br>w/Q9         | FM610.5<br>w/Q30        | FM610.6<br>w/Q25        |
|--------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|
| Viscosity (cps)          | 3000                    | 2800                    | 2600                    | 2500                    | 2500                    | 2600                    | 2100                    | 2100                    |
| pH                       | 6.02                    | 6.01                    | 6.08                    | 6.00                    | 6.01                    | 6.04                    | 6.08                    | 6.10                    |
| Appearance               | Honey liquid foundation | Honey liquid foundation | Honey liquid foundation | Honey liquid foundation | Honey liquid foundation | Honey liquid foundation | Honey liquid foundation | Honey liquid foundation |
| Stability @ RT/45°C      | Not good                | Good                    | Good                    | Not good                | Not good                | Not good                | Not good                | Not good                |
| Feel (1-10, 10 the best) | 8.5                     | 8.6                     | 8.6                     | 8.6                     | 8.5                     | 8.5                     | 8.7                     | 8.7                     |
| Compatibility            | Good                    | Good                    | Good                    | Good                    | Good                    | Good                    | Good                    | Good                    |

**Table 5: Specifications for eye shadow.**

| Specifications           | FM616<br>Control<br>w/DC9040 | FM616A<br>w/Q20 | FM616B<br>w/Q15 | FM616C<br>w/Q12 | FM616D<br>w/Q9 | FM616E<br>w/Q30 | FM616F<br>w/Q25 |
|--------------------------|------------------------------|-----------------|-----------------|-----------------|----------------|-----------------|-----------------|
| S.G.                     | 0.961                        | 0.964           | 0.968           | 0.974           | 0.965          | 0.961           | 0.960           |
| pH                       | 6.26                         | 6.33            | 6.25            | 6.23            | 6.19           | 6.28            | 6.30            |
| Appearance               | Bronze paste                 | Bronze paste    | Bronze paste    | Bronze paste    | Bronze paste   | Bronze paste    | Bronze paste    |
| Stability @RT            | Good                         | Good            | Good            | Good            | Good           | Good            | Good            |
| Feel (1-10, 10 the best) | 8.5                          | 8.6             | 8.5             | 8.5             | 8.5            | 8.6             | 8.7             |
| Compatibility            | Good                         | Good            | Good            | Good            | Good           | Good            | Good            |

FM616 B – 10 w/w% Q15, FM616 C – 10 w/w% Q12, FM616 D – 10 w/w% Q9, FM616 E – 10 w/w% Q30, FM616 F – 10 w/w% Q25.

As the ratio of M to Q in the MQ resin molecule increasing, the texture or feel of the eye shadow changes from a more solid powdery to liquid powdery to solid powdery feel after dry on skin.

### Waterproof mascara

The formulations for the waterproof mascaras were identical except that in Part B the control, FM617 C and D contained no MQ resin, while the rest contained the following: FM617 A – 5 w/w% Q20, FM617 B – 5 w/w% Q15, FM617 E – 5 w/w% Q30, FM617 F – 5 w/w% Q25.

In Part C, the control contained 5 w/w% of Cosmethicone SF-600, while FM617 C contained 5 w/w% of Q12 and FM617 D contained 5 w/w% of Q9.

The high molecular weight MQ resins in isododecane, (Silmer Q12, Q9) resins cannot be heated up to 75~80°C, they must be added to the batch after the batch cooling down to around 40°C.

The lower molecular weight pure liquid MQ resins (Silmer, same as Q12 and Q9, but Q30, Q25, Q20 and Q15) can be added directly to join in the emulsion, because they are pure resins with good fluidity and high boiling point.

The benefits of using Q compounds are: waterproofing, helping pigment disperse, and formation of a film.

### Sunscreen lotion

The sunscreen lotion formulations were identical except that in phase B the control, FS408-3, and FS408-4 contained no MQ resin, while the rest contained the following: FS408-1 – 8 w/w% Q20, FS408-2 – 8 w/w% Q15, FS408-5 – 8 w/w% Q30, FS408-6 – 8 w/w% Q25.

In Phase B the control contained 8 w/w% Jeasilc IDD, while FS408-3 contained 8 w/w% Q12 and FS408-4 contained 8 w/w% Q9.

The sunscreen made with Q25 feels the best and also carries good compatibility with organic sunscreen actives and solvents, improving stability and waterproofing.

**Table 6: Specifications of mascara.**

| Specifications           | FM617<br>Control<br>Cosmethicone<br>SF-600 | FM617F<br>M617Aw/Q20 | FM617B<br>w/Q15   | FM617C<br>w/Q12   | FM617D<br>w/Q9    | FM617E<br>w/Q30   | FM617F<br>w/Q25   |
|--------------------------|--|----------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| S.G.                     | 0.985                                      | 0.986                | 0.987             | 0.988             | 0.989             | 0.987             | 0.986             |
| pH                       | 7.00                                       | 7.02                 | 7.00              | 7.00              | 7.01              | 6.98              | 7.00              |
| Appearance               | Black brown Cream                          | Black brown Cream    | Black brown Cream | Black brown Cream | Black brown Cream | Black brown Cream | Black brown Cream |
| Stability @RT            | Good                                       | Good                 | Good              | Good              | Good              | Good              | Good              |
| Feel (1-10, 10 the best) | 8.5  | 8.5                  | 8.5               | 8.6               | 8.5               | 8.6               | 8.7               |
| Compatibility            | Good                                       | Good                 | Good              | Good              | Good              | Good              | Good              |

**Table 7: Specifications of sunscreen lotion.**

| Specifications          | FS408 Control IDD | FS408-1 Q20        | FS408-2 Q15      | FS408-3 Q12        | FS408-4 Q9         | FS408-5 Q30        | FS408-6 Q25        |
|-------------------------|-------------------|--------------------|------------------|--------------------|--------------------|--------------------|--------------------|
| Viscosity (cps)         | 2500              | 2600               | 2400             | 2500               | 2500               | 2500               | 2500               |
| pH                      | 7.02              | 7.12               | 7.10             | 7.03               | 7.02               | 7.01               | 7.01               |
| Feel 1-10, 10 the best) | 8.5               | 8.7                | 8.2              | 8.5                | 8.5                | 8.7                | 8.8                |
| Stability @43°C         | Stable for 1 week | Stable for 2 weeks | Stable for 1 day | Stable for 2 weeks | Stable for 2 weeks | Stable for 2 weeks | Stable for 2 weeks |
| Compatibility           | Good              | Good               | Good             | Good               | Good               | Good               | Good               |

## 2-in-1 shampoo

The formulations for the 2-in-1 shampoo were identical except the blank contained no MQ resin, while the rest contained the following: FH190 Control – 0.3 wt/wt% Siltech F60,000, FH190A – 0.3 wt/wt% Q20, FH190B – 0.3 wt/wt% Q15, FH190C – 0.3 wt/wt% Q30, FH190D – 0.3 wt/wt% Q25.

## Foam performance evaluation

### Method

All products were evaluated with the same procedure. A 1000 mL cylinder with 10 mL increments was used. All samples and distilled water was prepared at 25°C. 1.00 gram of test material was used and 100 mL distill water was added to dissolve the test material in a 250 mL beaker. After the test material was totally dissolved, the solution was transferred into the cylinder. An outlet air pump was sited on the bottom of the cylinder to generate the bubbles. The foam height was recorded within 20 seconds for each test material, and each material was evaluated three times and their averages were documented.

The scale for foam height is 1000 mL (outstanding) to 100 mL (very poor). The type of foam was also noted whether it is tight or loose. Bubbles were generated by electronic air pump.

### Result

All foams were tight and uniform; all MQ resins do not affect shampoo foam performance compared with Blank sample and Control sample.

**Table 8: Specifications of shampoo.**

| Specs formula                    | pH   | Viscosity (cps) (Brookfield LVT #4, 30 rpm) | Appearance  | Stability @42°C    |
|----------------------------------|------|---|-------------|--------------------|
| FH190 Blank                      | 5.45 | 7000  | White cream | Stable for 4 weeks |
| FH190 Control w/ Siltech F60,000 | 5.50 | 7100  | White cream | Stable for 4 weeks |
| FH190A w/Q20                     | 5.51 | 7000  | White cream | Stable for 4 weeks |
| FH190B w/Q15                     | 5.52 | 7100  | White cream | Stable for 4 weeks |
| FH190C w/Q30                     | 5.45 | 7000  | White cream | Stable for 4 weeks |
| FH190D w/Q25                     | 5.46 | 7000  | White cream | Stable for 4 weeks |

**Table 9: Foam performance evaluation.**

| Sample (Bubble for 20 sec)       | Initial reading (average, mL) | 2 minute reading (average, mL) | 5 minute reading (average, mL) |
|----------------------------------|-------------------------------|--------------------------------|--------------------------------|
| FH190 Blank                      | 705                           | 695                            | 683                            |
| FH190 Control w/Siltech F60, 000 | 690                           | 680                            | 660                            |
| FH190A w/Q20                     | 700                           | 690                            | 680                            |
| FH190A w/Q15                     | 700                           | 690                            | 680                            |
| FH190A w/Q30                     | 700                           | 690                            | 680                            |
| FH190A w/Q25                     | 700                           | 690                            | 680                            |

## Hair evaluation for shampoo

All products were evaluated on 10-inch Virgin Brown Hair. Two x 2-gram swatches were used for each material tested, all from the same lot. All swatches were wet with water 25°C and one gram of test material was used for each swatch. Swatches were washed and then rinsed for at least one minute per swatch. Wet comb evaluation was then performed. No blow-drying of hair was done. All swatches air-dried then the dry comb evaluation was performed once hair was completely dry.

Scale used is 1 to 10, 10 being the best. Used for wet and dry combing.

### Result

Shampoo with 0.3% of Q25 resin is the best in terms of wet comb and dry comb. Shampoo with Q20 resin is good at oil-proofing for oily hair conditioning.

## Build-up experiments

Only using shampoo with Q25 to do build up test on European virgin brown hair.

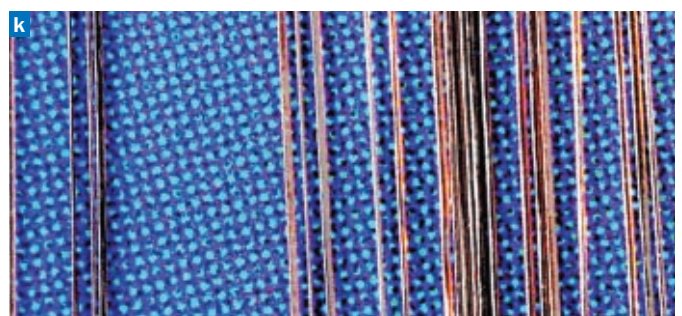
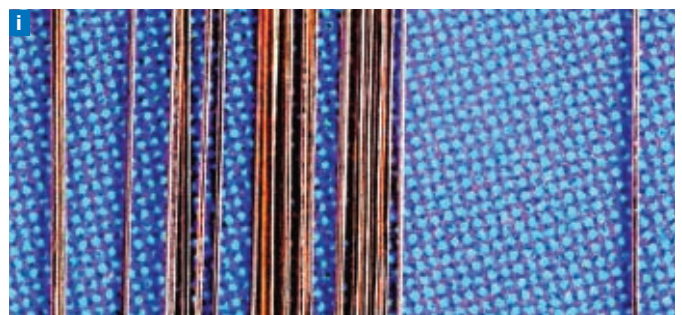
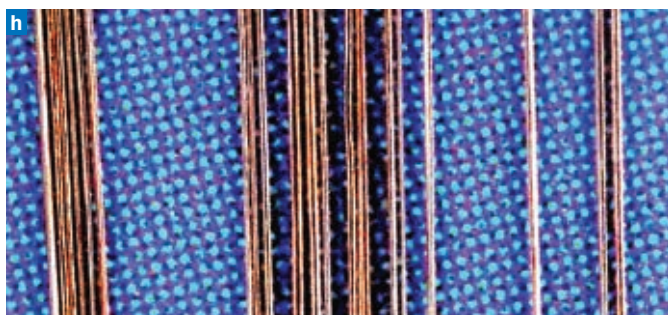
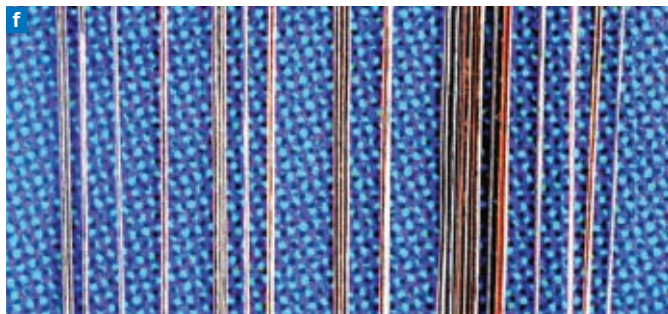
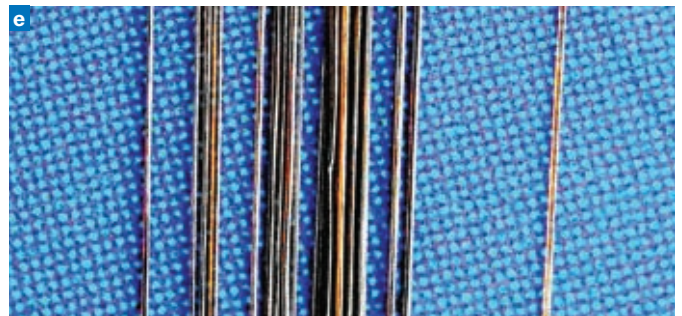
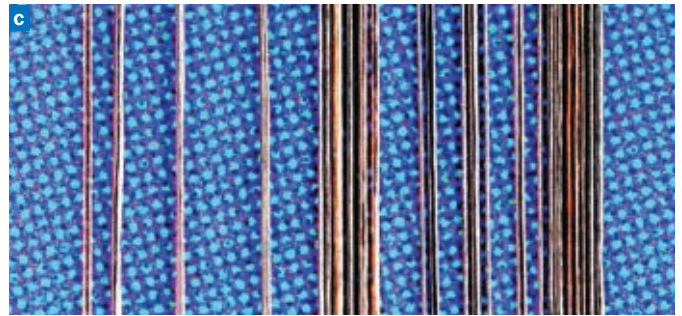
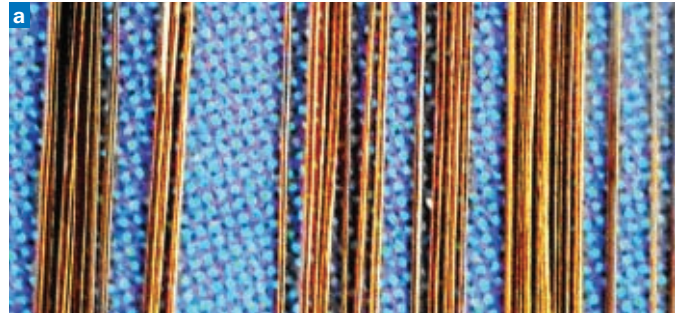
2-in-1 Shampoo FH190D with Q25 was

**Table 10: Wet comb evaluation.**

| Sample                           | Wet comb | Rinse off | Clean feel | Shine | Residual feel | Average |
|----------------------------------|----------|-----------|------------|-------|---------------|---------|
| FH190 Blank                      | 8.2      | 8.4       | 8.4        | 8.2   | 8.3           | 8.3     |
| FH190 Control w/Siltech F60, 000 | 8.7      | 8.7       | 8.8        | 8.6   | 8.7           | 8.7     |
| FH190A w/Q20                     | 9.2      | 9.2       | 9.2        | 9.2   | 9.2           | 9.2     |
| FH190A w/Q15                     | 8.9      | 8.9       | 8.9        | 8.9   | 8.9           | 8.9     |
| FH190A w/Q30                     | 9.0      | 9.0       | 9.0        | 9.0   | 9.0           | 9.0     |
| FH190A w/Q25                     | 9.3      | 9.3       | 9.3        | 9.3   | 9.3           | 9.3     |

**Figure 7:** Photographic results of 2-in-one shampoo test.

- a) European virgin brown hair.
- b) European virgin brown hair washed with shampoo (w/Q25) 1 time.
- c) European virgin brown hair washed with shampoo (w/Q25) 2 times.
- d) European virgin brown hair washed with shampoo (w/Q25) 3 times.
- e) European virgin brown hair washed with shampoo (w/Q25) 4 times.
- f) European virgin brown hair washed with shampoo (w/Q25) 5 times.
- g) European virgin brown hair washed with shampoo (w/Q25) 6 times.
- h) European virgin brown hair washed with shampoo (w/Q25) 7 times.
- i) European virgin brown hair washed with shampoo (w/Q25) 8 times.
- j) European virgin brown hair washed with shampoo (w/Q25) 9 times.
- k) European virgin brown hair washed with shampoo (w/Q25) 10 times.



**Table 11: Dry comb evaluation.**

| Sample        | Dry Comb | Dry Feel | Clean Feel/Look | Shine | Fullness/Manageable | Flyaway/Static | Water response | Softness | Average |
|---------------|----------|----------|-----------------|-------|---------------------|----------------|----------------|----------|---------|
| FH190 Blank   | 8.5      | 8.5      | 8.6             | 8.5   | 8.5                 | 8.4            | 8.5            | 8.5      | 8.5     |
| FH190 Control | 8.8      | 8.8      | 8.8             | 8.8   | 8.8                 | 8.5            | 8.9            | 8.8      | 8.8     |
| FH190A w/Q20  | 9.2      | 9.2      | 9.2             | 9.2   | 9.2                 | 9.2            | 9.2            | 9.2      | 9.2     |
| FH190A w/Q15  | 9.0      | 9.0      | 9.0             | 9.0   | 9.0                 | 9.0            | 9.0            | 9.0      | 9.0     |
| FH190A w/Q30  | 9.0      | 9.0      | 9.0             | 9.0   | 9.0                 | 9.0            | 9.0            | 9.0      | 9.0     |
| FH190A w/Q25  | 9.3      | 9.3      | 9.3             | 9.3   | 9.3                 | 9.3            | 9.3            | 9.3      | 9.3     |

**Table 12: Specifications of AP stick.**

| Stick                 | Appearance | Compatibility* | Stability (at 42°C) | Slip* | Hardness** |
|-----------------------|------------|----------------|---------------------|-------|------------|
| FA802                 | Off-white  | 8.5            | At least 7 days     | 8.8   | 66         |
| FA802A w/Silmer Q20   | Off-white  | 9.0            | At least 6 weeks    | 9.2   | 63         |
| FA802B w/Silmer Q15   | Off-white  | 8.2            | Not stable          | 9.0   | 64         |
| FA802C w/Q30 adjusted | Off-white  | 9.0            | At least 4 weeks    | 9.3   | 62         |
| FA802D w/Q25 adjusted | Off-white  | 9.0            | At least 4 weeks    | 9.3   | 62         |

\*Scale used is 1 to 10, 10 being the best. Applied for Compatibility and Slip.  
 \*\*Hardness was test by using PTC Instruments Model 411 Type 00. Method: ASTM D2240.  
 Data were obtained by average of three times tests for different spots in each sample.

over 10 times. The thin uniform films of conditioner reagent on the hair are almost the same for each time after the hair washed with 2-in-1 shampoo with Q25 resin.


**Antiperspirant stick**

The formulations for antiperspirant stick were identical except the control wich had no MQ resin, while FA802A contained 2 wt/wt% Q20, FA802B contained 2 wt/wt% Q15, FA802C contained 2 wt/wt% Q30, FA802D contained 2 wt/wt% Q25.

FA802A with Silmer Q20 is the best for AP stick formulation.

**Conclusion**

Table 8 offers an overview of the various applications that MQ resins are suited to. The results show that Q25 appears to be applicable in all of the tested applications and Q30 in all but two (2-in-1 shampoo and hair conditioner).

MQ resins have been shown to be a highly versatile addition to a formulator’s armoury and look set to be used in an increasingly wide selection of products. 

**References**

- 1 O’Lenick T. Understanding Silicone. *Cosmetics and Toiletries* 2006; **121** (5).
- 2 Huang W, Huang Y, Yu Y. The effect of the acid catalyst on preparation of MQ silicone resins. *Chinese Journal of Polymer Science* 1999; **17** (5): 429-33.

evaluated on 10-inch Virgin Brown Hair. Two x 2-gram swatches were used. The swatches were wet with water (25°C) and one gram of FH190D w/M2.5Q1Q25 resin was used for each swatch. Swatches were washed and then rinsed for at least one minute per swatch. No blow-drying of hair was done. All swatches were dried with paper towel and finally air-dried, and then build-up evaluation was performed once hair was completely dry. Repeat the above procedure 10 times. Keep record of each time’s build-up situation.

The build-up was studied by microscopy method. The method used is described as the following: Baush and Lomb Measuring

Optical Magnifier (10X) and Coolpix L20 Nikon Digital Camera (2X) were combined to take pictures of hair cuticles from the swatches. Pictures were processed (10X) by using Adobe Photoshop 7.0. Results are listed in Figure 7.

From the figures above, we can see that each hair cuticle has uniform shiny surface after virgin hair treated with 2-in-1 shampoo with 0.3% of Q 25, this means that the coating film on each hair cuticle is thin and uniform compared with untreated virgin hair.

After the hair was treated with shampoo with resin over and over again, there is no accumulation of conditioning reagent each time on the hair even the hair washed

**Table 13: Applications of MQ resins.**

| Application             | Q30            | Q25        | Q20            | Q15            | Q12            | Q9             |
|-------------------------|----------------|------------|----------------|----------------|----------------|----------------|
| Face cream              | Applicable     | Applicable | Applicable     | Not applicable | Not applicable | Not applicable |
| Lip stick               | Applicable     | Applicable | Applicable     | Not applicable | Not applicable | Not applicable |
| Body moisturising stick | Applicable     | Applicable | Applicable     | Not applicable | Not applicable | Not applicable |
| AP Stick                | Applicable     | Applicable | Applicable     | Not applicable | Not applicable | Not applicable |
| Foundation              | Applicable     | Applicable | Applicable     | Not applicable | Applicable     | Applicable     |
| Lip gloss               | Applicable     | Applicable | Applicable     | Applicable     | Applicable     | Applicable     |
| Sun screen              | Applicable     | Applicable | Not applicable | Applicable     | Applicable     | Applicable     |
| Mascara                 | Applicable     | Applicable | Applicable     | Applicable     | Applicable     | Applicable     |
| Eye stay                | Applicable     | Applicable | Applicable     | Applicable     | Applicable     | Applicable     |
| Eye shadow              | Applicable     | Applicable | Applicable     | Applicable     | Applicable     | Applicable     |
| 2-in-1 shampoo          | Not applicable | Applicable | Not applicable | Not applicable | Not applicable | Not applicable |
| Hair conditioner        | Not applicable | Applicable | Not applicable | Not applicable | Not applicable | Not applicable |