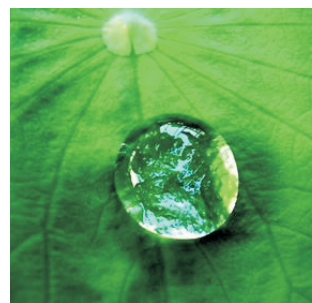


Saraqvest

Exclusive Insight



**Chemistry Behind
Good Feelings**

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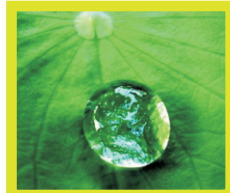
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Silicone Fluids



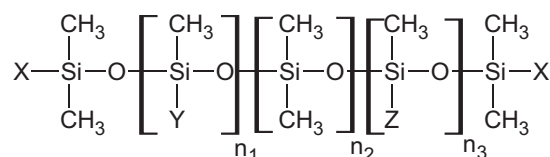
Amido and Amino Base

Softeners have gained great importance in textile finishing. No textile fabric leaves from the production house without being treated with a softener. Softeners improve the aesthetic properties by imparting the desired handle. A soft, supple fabric handle is particularly important to achieve overall comfort. Amongst various types of softeners, silicones are widely used for desired softness.

Silicones have certain characteristics such as low surface tension, durability and unique surface properties, which clearly distinguish them from conventional softeners, but are expensive. Silicones impart softening to the fabric and also improve physical properties, such as wrinkle resistance, abrasion resistance and tear strength. Silicones include dimethylpolysiloxane and methylhydrogenpolysiloxane polymers as well as a wide range of organo-modified polysiloxanes.

Silicone fluids are long chain polymers having silicon - oxygen - silicon backbone. Apart from two oxygen bonds, the tetravalent silicon atom also has two pendant organic functional groups. By varying organic functional groups and chain length, the properties of silicone change. Silicones

generally have molecular weight of 5000-75,000 and viscosity varies from 100-100,000 cps.



$$n_1 + n_2 + n_3 = 70-1000$$

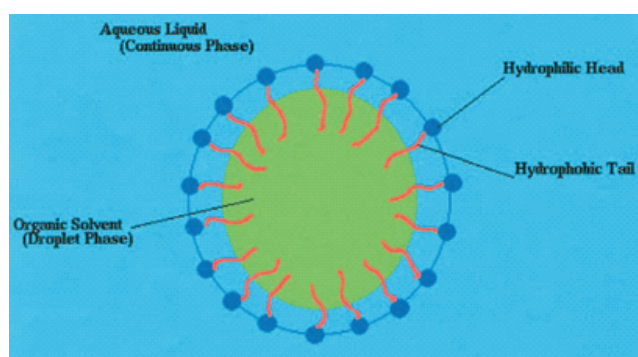
X, Y, Z = same or different chemical group

The specific properties imparted to the fabric by silicones depend upon the nature of the organic functional groups viz. amino, carboxy or epoxy groups. A typical silicone molecule bears a helical structure, however, introduction of such groups tends to open up the structure exposing the oxygen which will bond with polar surfaces via hydrogen bonding.

Silicone fluids can be chemically modified (copolymerized) to form a large number of other silicone products. The siloxane backbone is basically modified by two ways viz. either long alkyl chains are substituted by the methyl groups or it is copolymerized with organic polymers like polyethylene oxide (-CH₂CH₂O-) or polypropylene oxide (-CH₂CH₂CH₂O-).

These modifications transform the hydrophobic silicone fluids into hydrophilic silicone fluids.

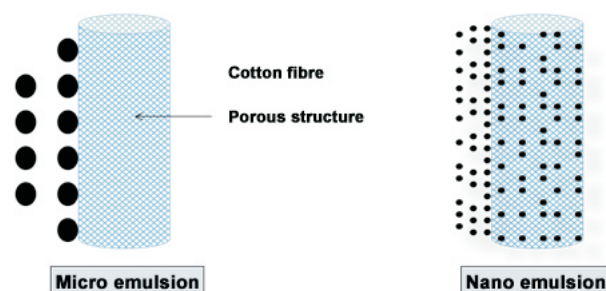
The addition of dimethylpolysiloxane to fabric softener formulations significantly improves the water absorbency of softened cotton fabric. This effect is also true for ester-quat-based softeners. The diverse property of the silicone can be changed by changing the reactive group in the structure. Amino-modified silicones are mostly used in the textile industry because amino groups provide better affinity for textile fibres. The end group of the amino-silicone polymer with hydroxyl, methoxy, or ethoxy group improves reactivity with fibres. However, if the end group is a methyl group then the polymer will be non-reactive to fibres. The high bonding affinity of the amino group makes silicones more substantive to fabrics than the other silicone polymers. In general, amino-functional silicones are reasonably durable to home laundering. Amido-functional silicones have a limited range of viscosities and nitrogen content. The benefits of amido-silicones are highly effective softening, ease of ironing, hydrophilic and low yellowing. They are more substantive to fabrics than dimethylpolysiloxanes.



Silicone fluids are generally used in the form of aqueous emulsions. The emulsion form of silicone makes easier dilution with water and leads to even distribution on the substrate. When silicone fluids are emulsified with water, the type of emulsion will be “oil in water”. The hydrophobic tail of the emulsifier points towards the oil droplets and the hydrophilic head centers confer solubility in water.

The stability of emulsions depends on the size of the particles.

Macro silicone emulsions have a particle size of 100-50,000 nm and they impart extremely good surface smoothness. The emulsion appears milky as the particles are larger than the wavelength of light and they block the passage of light through it. Micro silicone emulsions have particle sizes less than $\frac{1}{4}$ th the wavelength of light and are translucent-to-clear in appearance.



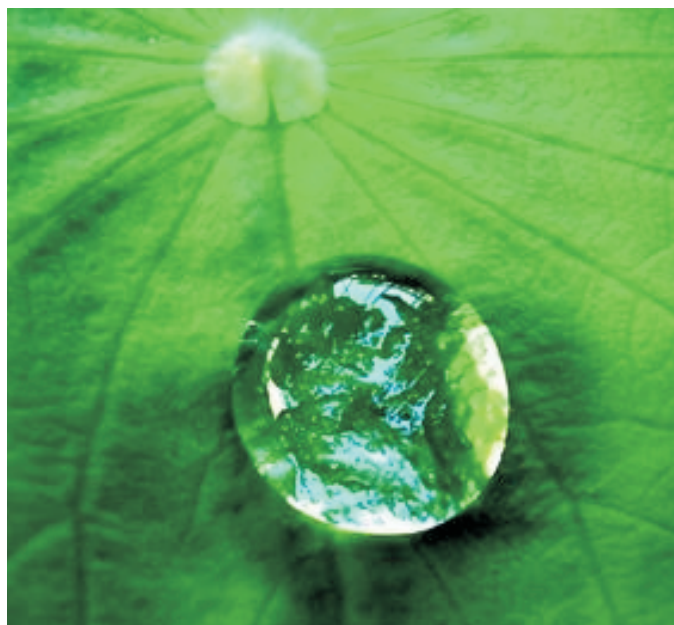
These emulsions impart useful properties like improved handle, better durable press, increased stretch and recovery of knitted fabrics and durability to home laundering. Nano silicone emulsions are stable to shear forces and clear in appearance as they have a particle size in the range of 20 nm. They easily diffuse into the inner structure of the fibers of the fabric thereby reducing interfiber friction. This helps in imparting excellent body-break and drapability along with better durability to home laundering.

Sarex has developed various new generation **Silicone fluids** to meet the recent requirements of changing era. These fluids can be easily emulsified and impart good softness with better feel and handle to the fabric. The emulsified product can be applied to textile substrate by exhaust as well as pad application. These fluids can be emulsified into micro and nano emulsions according to their characteristics.

Product Name	Type	Key features
Fluid-ODS	Amido	<ul style="list-style-type: none"> • Confers core softness and natural handle to all types of fibres • Hydrophilic character • Stable to shear forces • Non yellowing
Qsoft-POA	Amido	<ul style="list-style-type: none"> • Confers soft and supple handle to cellulosic and all types of fibres on various substates (woven, knitted, towel) • Hydrophilic character • Stable to shear forces and pH • Non yellowing
Ferma-986	Linear AB Quat	<ul style="list-style-type: none"> • Imparts greasy or peach handle with lubricity to all types of fibres • Hydrophilic character • Stable to shear forces and pH • Non yellowing
Ecofluid-8603	Monoamino	<ul style="list-style-type: none"> • Imparts very soft, drapable and elastic handle to woven and knitted fabrics • Ideal fluid for cotton or cotton/polyester blends • Improves sewability, tear strength and reduces abrasion loss • Low yellowing
Ecofluid-8417	Diamino	<ul style="list-style-type: none"> • Imparts durable softness, crease resistance, elasticity and lubricity for all types of fibres • Non yellowing
Ecofluid-4730	Diamino	<ul style="list-style-type: none"> • Imparts excellent durable softness and silky feel to all types of fibres • Good affinity to fabrics • Non yellowing
Ecofluid-AAZ	Diamino	<ul style="list-style-type: none"> • Imparts very soft, drapable and elastic touch to woven and knitted fabrics • Specially recommended to impart very good softness to polyester/cotton blended fabrics • No to minimum yellowing • No adverse effect on the shade or colour fastness properties of coloured goods
Ecofluid-23	Diamino	<ul style="list-style-type: none"> • Imparts very soft, drapable and elastic handle to cotton and its blends on woven and knitted fabrics • Improves wash and wear properties, crease recovery angle, sewability, tear strength and reduces abrasion loss

Ecofriendly fluorine free water repellent

Ecoguard-EF

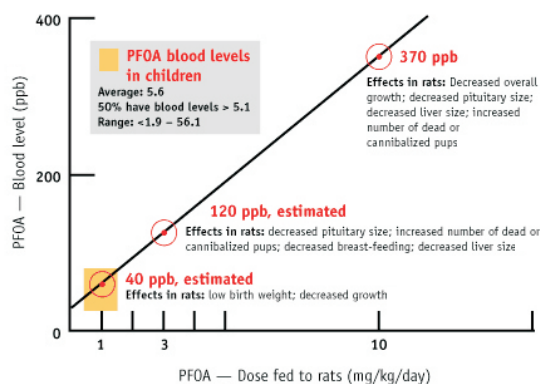


Water repellent finishes has historically been achieved with perfluorinated chemicals (PFCs) that contain a polymer to which long-chain perfluoroalkyl groups (termed as “C8”) have been attached. These long-chain fluorinated polymers often contain residual raw materials and trace levels of long-chain perfluoroalkyl acids (PFAAs) as impurities. Long-chain PFAAs includes perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS). These products are toxic and of high concern. For increasing demand of eco-friendly products, the first change was to move from PFCs based on C8 chemistry to C6 chemistry thereby eliminating PFOA/PFOS release into the environment.

A study by an environmental campaign group, ‘Greenpeace’ has found perfluorinated and polyfluorinated chemicals (PFCs), and other chemicals believed to be hazardous. The recently launched Greenpeace Detox Campaign aimed at working to eliminate harmful chemicals also targeted PFCs from the textile production process. Due to serious environmental campaign over the last few years about the impurities and side-products in the fluorocarbons, a thought of possible alternatives arose. Greenpeace is now urging the outdoor clothing industry to ban PFCs from production and to

speed the development of fluorine-free alternatives as harmful substances.

PFOA levels in human blood overlap with levels in laboratory studies that cause harmful effects



Sarex has made efforts to develop a new innovative economical, ecofriendly fluorine free durable water-repellent **Ecoguard-EF**. It imparts water repellency similar to that of C6-based fluorochemical to fabrics used in outdoor, leisure and sportswear applications.



Unique features of Ecoguard-EF

- Fluorine free product for water repellency and rain proofing for cellulosic and its blends.
- Fulfills requirement of leading retailers viz. M&S and H&M.
- Suitable for cotton, polyester and their blends.
- Performance is very close to C6 fluorochemicals in terms of water repellency and durability.
- Non yellowing hence suitable for white and pastel shade.
- Durable to multiple home laundering.
- Finished fabric is breathable and soft.
- Imparts sewability and also provides better resistance to abrasion and tear.
- Can be applied by padding, foam and spray process.

Results



Untreated



Treated

Cotton bottom weight

Finishing agent	Spray rating	
	Initial	5 HL
Cotton bottom weight		
Unfinished	-	-
90 g/l Ecoguard-EF	90	90

Finishing agent	Spray rating	
	Initial	5 HL
100% polyester		
Unfinished	-	-
100 g/l Ecoguard-EF	100	90

Application

Pad application:

Ecoguard-EF	: 40-100 g/l (polyester, cotton)
% expression	: 65 - 70 %
pH	: 6.0 - 7.0
Drying	: 120 deg.C, 2 min.
Curing	: 150 deg.C, 3 min. and 170 deg.C for 40 sec.

Recipe	100% Cotton	100% Polyester
Ecoguard-EF	90 g/l	100 g/l

Note: To get very good results, pick up should be more than 70% and curing temperature should be 160 deg.C and above. In case of polyester, at maximum pick up, curing at temperature 145-150 deg.C gives better spray rating.

Test Methods

Spray Rating : M&S P23

Stain Releasing Agent

Ecoguard-SR 6



Consumers are becoming more discerning in terms of added value. They demand clothes and other textile products that smell nice, stay fresh, feel comfortable, keep clean and are easy to care for, in short; keep on looking great. The demand for stain release textiles has increased due to lifestyle shifts, increased awareness and high end demand. The stain repellency/stain releasing concept has rapidly picked up in garments and textiles, home fabrics and sensitive technical fabrics.

The use of finishes that provide stain repel/release to the fabrics, particularly cotton and blends has shown amazing growth as they enable the stains to just roll off the fabrics or can be washed off easily. Stain repellency is the ability of a treated fabric to withstand penetration of liquid soils under static conditions involving only the weight of the drop and capillary forces while stain releasing is the ability of finished fabric to allow most stains to leave the fabric faster during normal laundering, increases the wicking action, and therefore imparts greater ease in cleaning.

The chemistry behind these finishes is fluorocarbon which have the unique property to provide fabrics with a low surface

energy with both high oil and water repellency properties to resist penetration of oil and water based stains. C6 fluorocarbon finishes have become the most important repellents of stains and dirt used on clothes, carpets, upholstery, draperies, leather and other household fabrics. They prevent the textile substrate from wetting by repelling the soiling substances and the adhesion of dry soil. They will not release any stains which has penetrated into the fabric.

Fluorocarbon hybrid finishes, also called 'dual effect', and containing hydrophilic groups impart stain repellency combined with stain release properties. The dual-effect technology functions by repelling water-based stains such as coffee, cola or blood by making bead of them thereby enabling them to roll-off. Moreover, at the same time releases/removes soils that has become stains from the fabric by surfactants and detergents into the wash liquor.

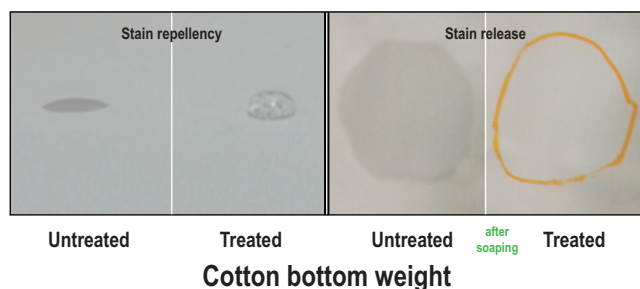
The mechanism of stain release has dual effect, where the hydrophobic fluorocarbon chains collapse during washing and the hydrophilic layer promotes stain release. After washing, the fluorocarbon chains are regenerated by heat and provide repellence once again.

Sarex has developed a new generation stain releasing fluorocarbon **Ecoguard-SR 6** based on C6 chemistry. It imparts very good stain release properties on various textile substrates. The finish on substrate allow the stains to leave fabric faster and makes the fabric clean. Treated fabric is durable to home laundering.

Unique features of Ecoguard-SR 6

- Preferred ecofriendly technology based on C6 chemistry.
- Easy removal of oily stains under normal home laundering conditions even at low temperatures.
- PFOA below detectable limit.
- Non yellowing and hence suitable for light and pastel shades.
- Good stain release property even after multiple home laundering.

Results



- Excellent stain repellency with good water and oil repellency.

Application

Pad application:

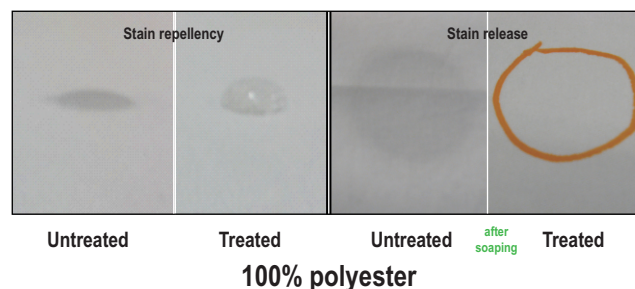
Pick-up	: 65-70%
Bath pH	: 4.5-5.0
Drying	: 110-130 deg.C
Curing	: 160-170 deg.C, 2-3 min.

Recipe	100% Cotton	100% Polyester
Ecoguard-SR 6	30-50 g/l	20-40 g/l
Isopropyl alcohol	5 g/l	5 g/l
Acetic acid	1-2 g/l	1-2 g/l

Note: Addition of extender Fabprotect-X improves fastness to washing.

Test Methods

Soil Release	: Oily Stain Release Method AATCC 130
Oil Rating	: M&S C50
Spray Rating	: M&S P23



Finishing agent	Corn oil stain		Tomato ketchup stain		Oil rating		Spray rating	
	Initial	5 HL	Initial	5 HL	Initial	5 HL	Initial	5 HL
Cotton bottom weight								
Unfinished	2	-	2	-	-	-	-	-
30 g/l Ecoguard-SR 6	4-5	4-5	4-5	4-5	5	4	70	50
100% polyester								
Unfinished	2	-	2	-	-	-	-	-
30 g/l Ecoguard-SR 6	4-5	4-5	4-5	4-5	4	2	70	70

Colour Blooming Agent

Sarabloom-968



The perception of colour is an ability to detect wavelengths of electromagnetic radiation from other wavelengths. Normal daylight is a mixture of all the wavelengths to which we can respond and some to which we cannot like infra-red and ultra-violet rays. Eye respond to wavelengths between around 400–700 nm. In scientific terms, wavelengths in the visible range are based exclusively on the ability of human retinas to respond to them, and to discriminate between them to a significant degree. These discriminations are what we call colour.

Black colour is one of the highest volume shade dyed on polyester textile material and have great demand. A variety of products produced from these black colored textile fibers are used for home textiles and apparels. Polyester is the most widely used type of black dyed textile fibers hence, it is the largest product segment in the market. Due to its aesthetic and ultrasoft touch, polyester microfibres has been a major focus in research during the past decade. The higher surface reflectance of microfibres because of their greater specific surface area causes the appearance of dyed micro-fibres to be visually lighter than conventional fibres of higher linear density dyed to the same dye depth.

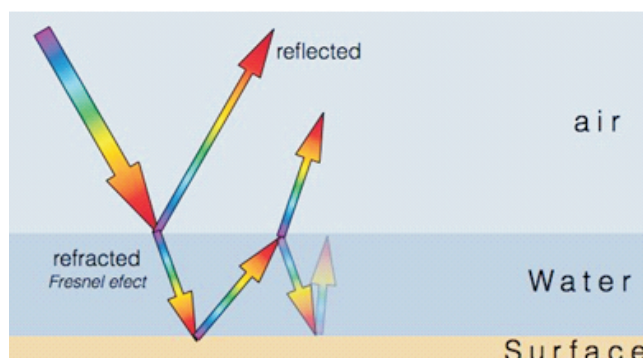
Generally, it is very difficult to obtain the superior jet black colour even if large quantity of dyestuffs is used. This is due to the saturation of dye on to the fibre beyond which addition of dyestuff does not increase the depth. In addition, higher depths may lead to bronziness and inferior fastness properties. Colour deepening agents are used to obtain the jet black economically and with better fastness.

When dyed fabric is wetted in water having a refractive index of 1.33, the dyed fabric appears to be deep, sharper and darker than the fabric when it is dry. This is caused by reduction in the surface reflectivity of dyed fabric. Reflection of light occurs when the waves encounter a surface or other boundary that does not absorb the energy of the radiation and bounces the waves away from the surface.



The amount of light reflected by an object, and how it is reflected, is highly dependent upon the degree of smoothness or texture of the surface. In this case, the wet surface decreases the reflection of light, and hence looks darker.

Scientifically, if a transparent polymer film having lower refractive index (less than 1.5) is formed on the surface of the dyed substrate, the colour can be made to appear deeper. Finishing with blooming agents significantly changes the reflectance spectra of the substrate. When a polyester fabric having a higher refractive index is finished with blooming agent it forms a transparent film on the substrate. This transparent film is of the refractive index, 1.33 that minimize reflectance in visible wavelength. This results in a decrease in the lightness value (L value), which helps the textile dyer to increase the depth of the shade.



Sarex has developed a novel colour deepening agent **Sarabloom-968** for shade enhancement of polyester and its blends dyed with black and navy blue dyes. It confers higher colour depth with neutral tone coupled with soft and pleasing handle on the fabric. **Sarabloom-968** does not lead to bronziness and does not hamper washing fastness & rubbing fastness.

Unique features of Sarabloom-968

- Does not hamper washing and rubbing fastness.
- Addition of softeners can be reduced.

- Compatible with cationic and nonionic products
- No nail / chalk mark

Application

Pad application:

Sarabloom-968	: 30-40 g/l
Pick-up	: 65-70%
Bath pH	: 4.5-5.0
Drying	: 110-130 deg.C, 1-2 min.
Curing	: 170-180 deg.C, 45-60 sec.

Results

Substrate	Unfinished	30 g/l Sarabloom-968
Colourant strength	100	140
dE	-	3.103
Da	-	0.128
Db	-	0.573
DC	-	-0.365
DH	-	0.460
L	13.597	10.550



Untreated polyester



30 g/l Sarabloom-968



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