

The future of concentrated finishes

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Introduction

A concentrate is a substance from which most of the solvent has been removed. Typically, this will be the removal of water from a solution or suspension, such as the removal of water from fruit juice.

Concentrated options are a more sustainable choice compared to ready-to-use products. With concentrated products, for example, the logistical impact on the environment is minimised. Since manufacturers aren't shipping the water used to dilute the chemical, more products can be sent at once which minimises the number of trucks on the road or trains on the rails. Another benefit

is that less packaging is required, which means fewer raw materials are consumed and less waste is generated. Ideally the packaging will be fully recyclable.

The benefits of concentrated products boils down to a mathematical equation which states that if the product is manufactured with less water, paper, ink and plastic, then less material ends up in landfill and more space is freed up in shipping. More product can be shipped at a time to distributors and less fuel is needed to move the product. Less fuel being used means fewer emissions in the atmosphere, reduced carbon footprint and fewer greenhouse gasses being produced. The

use of concentrated products is generally a money saver, and the environmental effects are even more advantageous.

Below are three benefits of switching over to concentrated products:

1. Transportation: concentrated products come in smaller containers when compared to non-concentrated products. This eliminates the inconvenience of, and safety hazards associated with, handling heavy drums.
2. Resource use: the amount of material required for the containers is reduced due to their smaller size.
3. Cost savings: these are accrued from minimised transportation and resource costs.

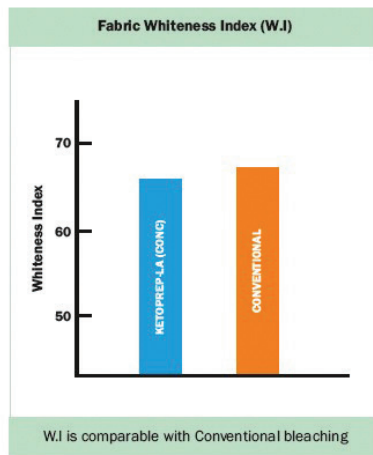
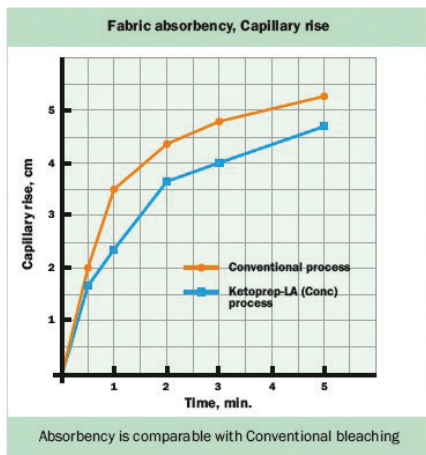
Concentrated products enable consumers to 'do more with less'. They also reduce the frequency of purchasing, the volume of packaging and the number of deliveries.

Sarex, over the years, has developed a series of concentrated products in textile wet processing, namely in pre-treatment, dyeing and finishing ranges.

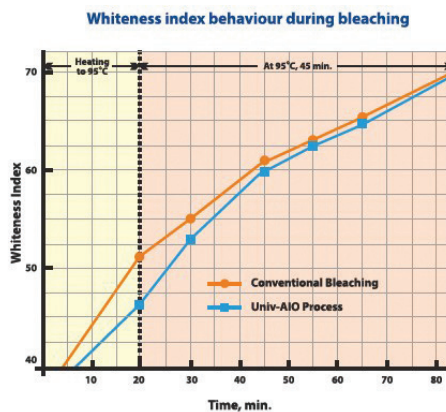
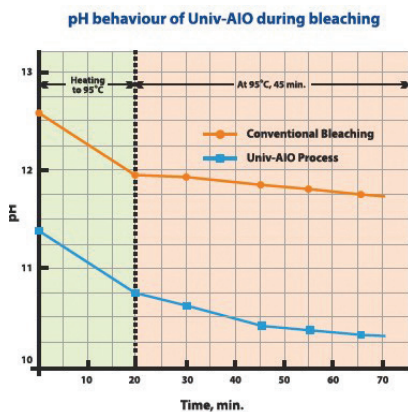
Pre-treatment chemicals

Bleaching aids:

The textile industry has become increasingly aware of the optimal use of resources like water, energy and, on the other hand, the fallout of pollution caused by industrial textile processes. The pre-treatment processes consume large quantities of water and energy. Combining any of the two, or all the processes, can result in huge savings in terms of water, energy and reduced effluent load. A one-step combined pre-treatment process cannot only reduce the load of COD (chemical oxygen demand) and BOD (biological oxygen demand) but will also make it suitable for cleaner textile processing by reducing the consumption of water and effluent discharge and savings in energy. Combining pre-treatment processes has remained an important research area



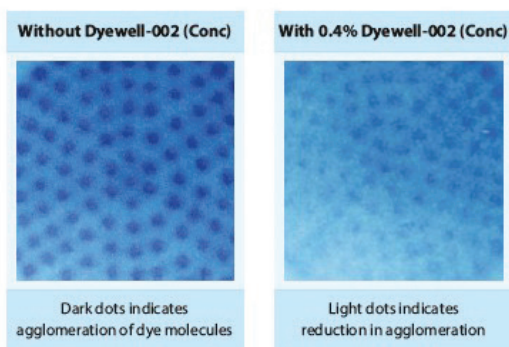
Performance of Ketoprep-LA(Conc) against conventional bleaching



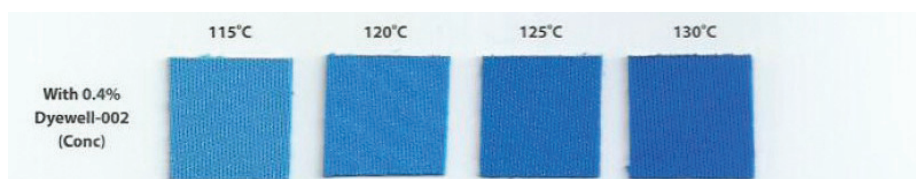
Performance of Univ-AIO against conventional bleaching

Technical briefing: concentrates

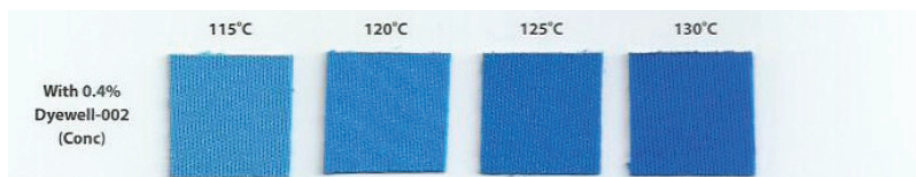
Dispersing property of Dyewell-002(Conc)



Leveling behaviour of Dyewell-002(Conc)

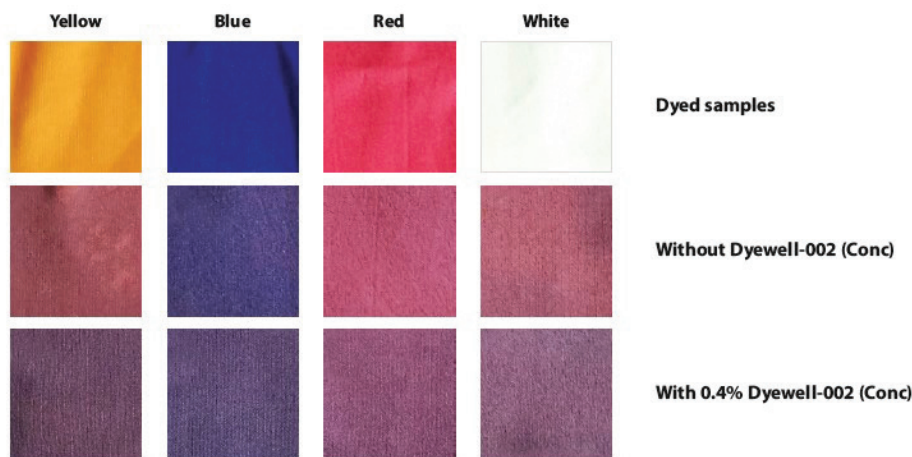


Sudden dye uptake observed from 125 oC to 130oC. This behavior of dye rushing may lead to the patchy dyeing.



Dyewell-002(Conc) controls the strike rate and gives solid and uniform shade. Gradual dye uptake is observed with the rise in temperature.

Leveling behaviour of Dyewell-002(Conc)



Dyed fabrics along with un-dyed fabric were treated at 130oC for 60 minutes. Migration behavior of dyestuff is observed. The photograph shows the almost equal and even distribution of each dyestuff on every fabric piece, which indicates good migration

Performance of Dyewell-002(Conc)

for cleaner, sustainable and economical textile processing.

Sarex has introduced a special product Ketoprep-LA(Conc) which is a novel bleaching aid for cotton that requires less caustic soda for bleaching. It is a 60% product with recommended dilution of 20%.

Additionally, the chemical producer offers Univ-AIO, a concentrated

all-in-one product which is available in powder form. The product is used for the combined scouring and bleaching of cotton and its blends. Bleaching requires only Univ-AIO and hydrogen peroxide - no caustic soda - and the bleaching action is milder compared to conventional bleaching. It also reduces the weight of cotton by 2-3% hence more material is

obtained after bleaching. As no alkali is added during Univ-AIO bleaching, a soft hand feel is achieved.

Sequestering agent:

A sequestering agent is a substance that removes ions from a solution system by forming a complex that does not have chemical reactions with the ion which is removed. Sequestering agents are also known as chelating agents. A chemical sequestering agent surrounds another molecule or atom and holds it "in seclusion". In this process, the chemical sequestering agent hides the molecule or atom and prevents it from entering into chemical reactions.

Cotton contains varying quantities of metal traces [iron, copper], which mainly come from fertilisers and insecticides. The iron content of caustic soda can exceed 100 mg/lit, so the use of sequestering agents becomes essential.

Cotton fabric usually has to be bleached by treatment with hydrogen peroxide under alkaline conditions in order to achieve a satisfactory level of whiteness through oxidation of coloured impurities. The trapped iron residue in the fabric acts as a catalyst in the bleaching process and causes hydrogen peroxide to undergo homolytic fission to form two hydroxyl radicals (OH•). This metal ion causes abnormal decomposition of hydrogen peroxide. The rate of decomposition may be so high that cellulose is attacked and oxycellulose is formed. The oxycellulose produced becomes visible in the form of tiny holes commonly addressed as iron pin-holes in the industry. Fabrics comprising pinholes have poor mechanical properties and are rejected as waste which is a cause of major concern for textile processing organisations.

To overcome these deleterious effects in the scouring and bleaching baths, sequestering agents are often used. These are compounds which sequester the metal cations rendering them harmless.

Dyeing

Leveling agents:

Leveling agents have become an integral part of dyeing recipes. Leveling agents help in producing uniform dyeings by covering up some of the physico-chemical reactions in the fibres. Leveling agents regulate the strike rate of the dye on the fibre because in many cases, due to poor dye migration, uneven dyeing can occur if the strike rate is not initially regulated.

Polyester leveling agent - Dyewell-002(Conc):

Dyewell-002(Conc) is a leveling/dispersing agent for polyester dyeing. It is available in 100% active liquid form. A suitable dilution of 50% can be prepared. Dyewell-002(Conc) is an excellent additive in disperse dyeing to obtain level dyeings. It has good migration properties. It disperses the dye during dyeing thus reduces the agglomeration of dye. It is highly suitable for blues and bright greens which are prone to patchiness. Only a small dosage of Dyewell-002(Conc) is required to get good results. It is highly effective in the corrections of faulty dyeings.

Nylon leveling agent - Nylolevel-606(XC):

Nylolevel-606(XC) is a leveling agent for polyamide fabric dyed with acid dyestuff and metal complex dyestuffs. It is available in 98% active liquid form. A suitable dilution of 25% can be prepared. Nylolevel-606(XC) molecules are non-ionic and will remain in the dye bath. This will hinder the movement of acid dye molecules thereby reducing their initial strike rate leading to even dyeing.

pH sliding agent - Acidon-PA:

Control of temperature and pH are the most important factors in the dyeing cycle with respect to level and reproducible dyeing. The pH of the dye bath may change during the dyeing process due to the absorption of acid by the fibre itself, increased alkalinity during boiling of temporarily hard water, and/or reduced alkalinity due to decomposition of ammonium salts. The control of pH in the dyeing of polyamide fibres with acid dyes is accomplished by either maintaining a relatively high degree of acidity or by gradually sliding the pH towards acidic conditions as dyeing proceeds. pH sliding agents are particularly useful for non-migrating acid dyes on nylon. The controlled lowering of the pH can be achieved by using product that releases more acidic compounds as they undergo decomposition as the dyeing temperature increases. At boiling temperatures, the product decomposes thereby gradually liberating acid that subsequently lowers the pH of the dye bath.

Sarex has developed one such product, Acidon-PA, a pH sliding agent which is available in 100% liquid form. With an increase in dyeing temperature,

Acidon-PA gradually decomposes which releases acidic components. Ideally, the pH of the bath is dropped at a rate which causes the dye to slowly diffuse into the polymer substrate. If the pH can be effectively controlled, the dye becomes evenly distributed throughout the bath and substrate. The final pH then slides towards the desired acidic pH to ensure the complete exhaustion of the dye.

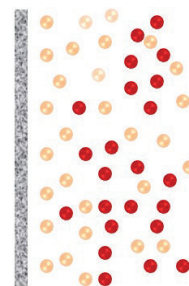
Reactive dye stripping agent:

Some common problems associated with the textile dyeing industry include uneven or faulty dyeing and the formation of colour patches on the fabric surface during the dyeing and downstream processing of textile materials. In some cases, it may be necessary to correct unlevel or excessively heavy dye-lots and re-dye to the original shade. Such problems in the finished quality of fabric are generally tackled through a chemical stripping process which is a common practice in dyeing industries for the deep shade batches. Stripping is one of the reproduction processes used in textile finishing to remove dyes from coloured fabric.

Washing off agents:

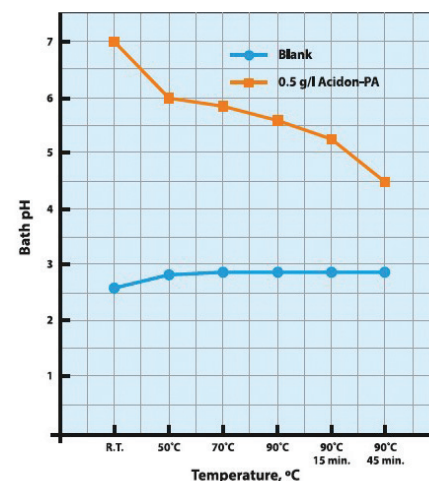
Reactive dyes are extensively used for the dyeing of cellulosic fibres because of their excellent wash fastness, which arises from covalent bond formation between dye and fibre. The dyeing of cellulosic fibres takes place with reactive dyes under alkaline conditions. But these alkaline conditions also facilitate a reaction from reactive groups with the water, resulting in dye hydrolysis. This hydrolysed dye has affinity for the fibre via hydrogen bonding and Vander Waals interactions, but is not covalently bonded and as such exhibits poor wash fastness. Washing reactive dyed fabrics is more complex. It is very difficult to remove the unreacted/unfixed dye from the fabric due to the presence of electrolytes. This hydrolysed dye must be removed by rinsing and using an appropriate washing-off agent in order to retain the fastness properties.

The washing-off efficiency of the product would depend upon the amount of unfixed dye and the ease of its removal. The washing-off agent should facilitate the diffusion of unfixed dye molecules from the fibre into the water. It must eliminate the negative effect of hard forming ions on the solubility of unfixed hydrolysed dye.



○ Nylolevel-606(XC) molecule ● Acid dye molecule

Mechanism of Nylolevel-606(XC)



Graph showing the shift in pH with increase in temperature in presence of Acidon-PA

Dye fixing agents

Dye fixing agents are of considerable interest in the art of textile colouration. Dyed and printed fabrics often have unsatisfactory wet fastness, especially washing and water fastness. In the case of all reactive dyestuffs, part will react chemically with a hydroxyl group on the cellulosic fibre while the remainder will react with the water present in the dye bath to form hydrolysed dye. In order to achieve the required wash fastness properties, the substrate should be free from the hydrolyzed dyes. The un-reacted and hydrolyzed dye may be removed by repeated washing, or else the repeated washing can be replaced using dye fixing agents which fix the unwashed hydrolysed dyestuff.

Finishing

When a textile assumes an additional purpose over and above a conventional textile it may be regarded as a specialty or functional textile. Specialty finishes include flame retardants, moisture management, antimicrobials, and even softness finishes.

Technical briefing: concentrates

Thermal yellowing prevention:

Heat setting is the process applicable to fabrics made from synthetic fibres like polyamide in which the fabric is subjected to the action of high temperature for a short time to make it dimensionally stable so that the garments made from such fabrics retain their shape when washed and ironed. White or light-coloured textiles made of polyamide and elastic fibres, as well as related combination fabric, can easily become yellow. With polyamide, it is difficult to override the partial heat set which is applied when the fabric is produced. As a result, when polyamide fabrics are moulded and heat set, it is necessary to approach the melting point of the nylon in order to override the partial heat set, resulting in a high incidence of yellowing and the fabric becoming brittle.

Chlorine fastness:

The colour fastness of reactive, direct, metal complex and acid dyes are very poor. Beach towels and swimming suits made of cotton and/or polyamide which is dyed or printed with these dyes are sensitive to high chlorine content in pool water and laundry wash liquors. Chlorine affects swimsuits to an almost irreparable extent. This water can

cause discolouration and fading of dyed garments. Thus, the fabrics used in products like swimsuits and towels, which encounter pool water, fade away and disintegrate because of repeated low level chlorine exposures. It becomes essential, therefore, to confirm the fastness to chlorinated pool water of these products.

Moisture management:

Comfort properties of textiles are more important than the aesthetic properties with varying end use applications. Apparel manufacturers are shifting their attention to moisture management fabrics as manufacturers of sports and active outdoor wear strive to improve the functionality of their collections.

Synthetic textiles have innumerable advantages, such as cost, durability, and flexibility. However, polyester and polyamide fabrics have limitations on sweat absorption and evaporation due to its inherent hydrophobic nature. This drawback of hydrophobicity can be overcome by the use of hydrophilising agents for synthetic textiles to provide comfort properties. When applied on polyester fabric, this forms a polymer film that interacts readily with water, imparting a hydrophilic finish.

Estofeel(Conc) for polyester is a solution which imparts excellent moisture management properties to fabric. It is a 100% concentrated product available in irregular lump form and 10% dilution can be easily prepared.

Flame retardants

The purpose of a flame retardant is to impart resistance on the substrate to flames and enhance human safety. Flame retardant finishes for synthetic fibres should either promote char formation by reducing the thermo plasticity or enhance melt dripping so that the drops can be extinguished away from the igniting flame. Flame retardant chemicals that are applied to fabrics are intended to inhibit or suppress the combustion process.

Concentrated flame retardants include:

- Flamguard-DPS: Durable flame retardant for polyester and polyamide fabrics
- Saraflam-CWF(M): Durable flame retardant for cellulosic fabrics
- Saraflam-PDR: A non-durable flame retardant for cellulosic, polyester and polyester/cotton blends

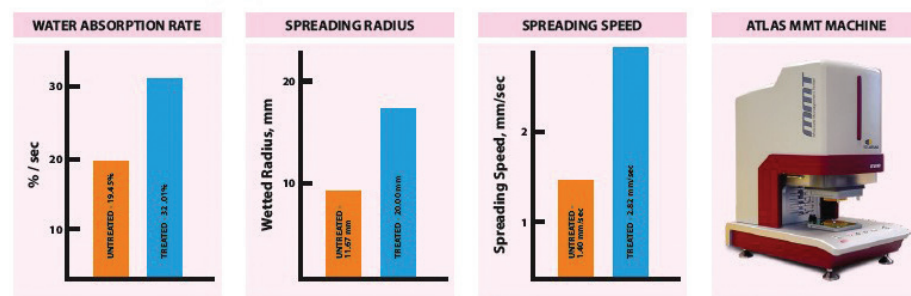
Antimicrobial finish

Cotton textiles near the human body provide an ideal living environment for bacteria, yeast, and fungi. In addition to providing these conditions, textiles are continuously exposed to microbial contamination from the skin, dust, airborne particles, and other sources. It is not surprising that large populations of microorganisms have been isolated from textiles.

Consumer attitudes towards hygiene and better lifestyle has created a rapidly increasing demand for antimicrobial textiles, which in turn have inspired antimicrobial finishing agents such as Saraguard-FL: an economical, durable, and non-leaching antimicrobial agent. Saraguard-FL is an 80% product and can be diluted to any given concentration as per the requirement. It is suitable for all substrates. It is also effective against a broad spectrum of microbes such as escherichia coli, staphylococcus aureus, methicillin-resistant staphylococcus aureus (MRSA) and klebsiella pneumoniae. The solution is compatible with continuous, exhaust, soaking and spraying methods and passes AATCC-100 and JIS L 1902 testing.



Absorbency efficiency of Estofeel(Conc) finished fabric by drop test



Various properties of Estofeel(Conc) finished fabric measured with an MMT machine (moisture management tester): AATCC 195: 2013