Performance Enhancement Finishes for Nonwoven Fabrics

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ABSTRACT

In recent years, with the improvement of standard of living and the pace with which human life is moving, customers require more and more functional fabrics. Nonwovens are one of the fastest emerging and exhilarating sector in the textile market. They are extensively used materials for technical textile applications ranging from medical textiles to geo textiles. Depending on the fibres used for manufacturing of nonwovens and their end uses, various functional finishes can be imparted to nonwoven fabrics to enhance their performance and serviceability. Performance properties include functional characteristics such as moisture management, water repellency, flame retardancy, antimicrobial finish etc. This paper focuses on some of the functional finishes which are critical for non-woven fabrics.

INTRODUCTION

Nonwovens are defined as distinctive, high-tech, engineered fabrics made from fibres, and are used for manufacturing of various products for numerous applications. The term 'nonwoven' is coined for fabrics that are neither knitted nor woven. They are materials having similar properties to woven and knitted fabrics but in this case the fabric is manufactured by bonding of fibres with each other chemically, mechanically or through heat or solvent treatment.

These fabrics are mostly porous sheets, directly made from fibres in a process that does not require the fibres to be transformed into yarn. Nonwovens offer a number of advantages over woven fabrics, one of the most important being that they are very economical, as their manufacture involves direct conversion of fibre to fabric, which leads to cost savings, less production time and the possibility of large volume production.

Fibres including cotton, viscose, polyester, polypropylene, etc, are extensively used in manufacturing of nonwovens by the needle punch technique, hydro entanglement, thermal bonding, chemical bonding, etc. Nonwovens used for technical textiles are primarily made from synthetic polymers, as strength and flexibility are of major importance.

Nonwoven have wide application in the field of technical textiles, some of which are listed below:

- Agrotech Crop covers, weed control fabrics, greenhouse shading, root bags, etc
- Buildtech Roofing and tile underlay, thermal and noise insulation, vertical drainage, textile construction, building components, etc
- Clothtech Shoe components, sewing products, interlining, clean room garments, etc
- Geotech Drainage, sedimentation and erosion control, pond liners, separation, reinforcement, filtration, offshore land reclamation, roadside, rail side, river and canal banks, and reservoirs
- Hometech Carpet components,









furniture components, consumer wipes, etc

- Meditech Drapes and gowns, sterile wraps, swabs and dressing, cleaning, cover stock, wound-care, protective apparel, bedding and sheets and masks
- Mobiltech Airbags, cabin air filters, engine intake and exhaust air filters, silencer pads, insulation materials, car covers, under padding, car mats, tapes, backing for tufted carpets, seat covers, door trim and insulation, floor coverings, protection and composites
- Protech Chemical and biological protection, particulate protection, flame retardant, cut resistant, shields and gowns worn in emergency response, chemical handling, hazardous waste control, cleaning and filtration.

For all of the above applications, some physical or chemical finishes are vital. Thus, in this paper we are focusing on some of the functional finishes which are required to meet the performance of the nonwoven material.

CHEMICAL FINISHING

Antimicrobial finishes

Nowadays, nonwoven fabrics are the most commonly used textiles for surgical gowns, patient drapes, laboratory coats, coveralls, etc. The need for hygienic clothing is of great demand for the materials used in domestic as well as industrial applications. Textiles materials are a source of food material for micro-organisms, so having an antimicrobial property is obligatory.

Fabrics affected by bacteria are a major cause of skin infections and irritations. Strength loss in fabric, discoloration and bad odour are some of the possible results of microbial attack on the fabric. Thus, application of antimicrobial agents on fabric is of prime importance so that the growth



of micro-organisms, viz. bacteria or fungus, can be inhibited. These types of finishes are used to prevent the biological degradation of fabric by bacterial or fungal growth. Mostly these finishes are based on silane, metallic compounds or natural biopolymer based.

Understanding the requirement and need of today's market, Sarex has developed an antimicrobial agent named Saraguard 5700, which is a methanol-free durable non-leaching antimicrobial and fungicide for broad spectrum microbes such as Escherichia coli, Staphylococcus aureus, Methicillinresistant Staphylococcus aureus (MRSA) and Klebsiella pneumoniae. This finish can be applied on substrates by padding, exhaust, spray or coating techniques. Saraguard 5700 passes the AATCC 100 test method.

Flame-retardant finish

Nonwovens are finding more and more applications in areas that were once ruled by woven materials. Nonwoven products are mainly manufactured using synthetic fibres such as polyolefins, polyester or nylon, which are highly flammable. The use of nonwovens manufactured with synthetic fibres can thus lead to an increased fire risk in many cases. This has to be taken into account even more nowadays, since there is a trend to replace high-cost materials by lower-cost materials, for example polypropylene. Flame-retardant finishes help to reduce flame propagation and suppresses smoke emission. They are mainly made of nitrogen-phosphorus compounds.

Many of these finishes are available in fibre form to be blended in the fabric during the process of manufacturing. They are also present in polymer-dispersion form to be applied through padding or coating. This type of finish is mainly applied on car interiors, carpets, artificial turf, ballooning fabric, parachutes, tents, firefighters' clothing, etc. Considering the need of the hour for flame retardants, Sarex has developed a unique flame retardant, Flamguard-DPS, which is a halogen-free, durable flame-retardant finishing chemical for synthetic fibres, which gives minimum shade change. It can be applied by padding and by the spray method. Flamguard-DPS passes the BS-3119 (1959) & BS-3120 Vertical flame test for flame-proof materials.

Water and oil repellent finish

Nonwovens possess many characteristics such as soft handle, good drapability, good hydroscopic property, good ventilation property and slippery appearance but they lack many functional properties such as water and oil repellency. Water and oil can act as pollutants which can impair the performance and serviceability of the fabrics. Thus, to improve the serviceability and to meet the product requirements, a water and oil repellent finish can be imparted.

Such finishes are used to inhibit wetting of fabrics. They mainly comprise silicone or fluorocarbon compounds. Conventionally, wax finishes were applied, which used to reduce the breathability of fabrics. Fluorocarbon compounds also provide repellency to oil, diesel and gasoline to synthetic fibres. They can be applied by coating, spraying, and padding methods.

Sarex has developed a new-generation fluorocarbon C6-based water and oil repellent, Careguard-66 (New), which imparts durable water and oil repellency on various substrates, viz. polyester, cotton, nylon, wool fibres and their blends, without affecting the original hand of fabric. It can be applied by pad foam and spray techniques. The performance of Careguard-66 (NEW) will be closer to that of C8-chemistry fluorocarbons.

Fragrance finishes

Fragrance finishing of textiles is the process where we enhance the value of the product by adding some aroma to it. The active materials giving fragrance and the essential oil are volatile substances, and thus the most difficult task in preparing the fragrance-emitting textile is how to prolong its durability. Micro-encapsulation is an effective technique to solve this problem. Microcapsules are minute containers that are normally spherical if they enclose a liquid or gas, and roughly of the shape of the enclosed particle if they contain a solid. They can be considered as a special form of packaging, in that particulate matter can be individually coated for protection against the environment and the volatile substance can be released from the enclosing capsule as required. This property has enabled microcapsules to serve many useful functions and find applications in different fields of technology.

The uses of aromatherapy in textiles are diverse. Interior textiles such as sheets, quilt-covers, curtains, carpets and bed-gowns are suitable for the attachment of lavender, citrus or cinnamon microcapsules, which are good for hypnogenesis and eliminating fatigue. The fabrics finished with the above fragrances can be used in apparel, leisure wear, daily wear, party wear, etc. For sportswear, fragrances may be orange or lemon. Perfumed toys make it easier for children to get closer to nature.

Considering the above market, Sarex has developed a range of Superfresh finishes in Lavender, Peppermint, Jasmine and Rose flavours. Superfresh finishes are a new range of odour-absorbing and refreshing finishes. They impart durable fragrance to the fabric. Fragrance is released from microcapsules due to the abrasion that occurs under normal wearing conditions. They are applicable on synthetic and natural fabrics by padding and spraying.

Abrasion resistance finish

Nonwoven fabrics have a common disadvantage when fabric properties are compared with woven and knitted fabric, particularly in terms of surface abrasion, pilling and durability in multiple-use applications. Nonwoven materials used in car interiors or home furnishings require such durability, as they come under constant abrasion and friction, causing wear and tear of the fabric, with loss of strength,





pill formation and break-down. To avoid such conditions Sarex has developed an anti-pilling agent, Helafin-42, which improves resistance to pilling, snagging and tearing. Helafin-42 can be applied by exhaust as well as pad application. It can be applied in combination with water-repellent agents and with resins. The finish obtained with Helafin-42 is resistant to washing and dry cleaning.

CONCLUSION

The world marketplace is continuously changing, and so are the demands of people. Every person desires some change, ie. something new and unique. Advances in nonwovens have resulted in a new strain of textiles with high functionality. Advanced composite materials containing a combination of fibres and fabrics have been developed for applications where biocompatibility and strength are required. It is predicted that nonwoven materials will continue to have a greater impact in this sector, owing to the large number of characteristics and performance criteria required from these materials and the availability of functional finishing to ensure that they deliver.

We at Sarex Chemicals can be a solution provider to its customers to meet the requirement of various functional finishes on nonwoven substrates.