

CASE STUDY

Adding Extensibility and Drape to Medical Nonwovens



Summary

At MICREX, we take confidentiality very seriously. For this reason we do not publicize current projects; however, we do highlight mature applications. These provide an inside look into the MICREX Technology and how trials merge with customer technology to add desirable properties to enhance existing products, such as absorbency, bulk, extensibility and stretch, decorative effects, and softness, drape and hand.

In the late 1960's a producer of medical nonwovens, Wycombe-Marsh, which has since been acquired by Argo Wiggins Healthcare, was looking to add aesthetic qualities and functional properties to its sheet product, specifically softness and extensibility. MICREX delivered these product enhancements using its MICREX®/Microcreper™ and by guiding the modification of the base substrate.

Challenge and Requirements

The medical market is very specialized and at that time was divided into three sections: Medical Bags and Pouches; Medical Crepes; and Drapes, Gowns and Heavy Duty Wraps.

Medical Bag & Pouch

History of the Market:

Medical Bag production was the forerunner to many of the medical papers used today as disposables in hospitals worldwide. Early production of Bag and Pouch paper was normally undertaken on a M.G. type paper machine, as it was preferred by many of the bag converters. They would print in line on the web's smooth underside and shape the bag with the rough topside of the web to form the bag's inside. Specification in the early days was fairly loose: there was a minimum wet & dry burst and tensile strength, with a generous substance range. The pouch grade is very similar to the bag grade in specification; the end use of pouch paper is for conversion into bubble packs for needles, syringes, etc.

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Current Market Situation:

The paper maker faces a very different market situation today. The Medical Bag and Pouch paper market is very competitive, with manufacturing bound by a very tightly controlled specification by the BSI or DIN standards. Most bag and pouches produced today are white and are made from 100% cellulose fiber. No recycled material is permitted. While some of the production is still done on MG machines, it is more common to use the fourdrinier.

Medical Crepes

The Medical Crepe Market:

When crepe paper was first used in the medical market, it was made from 100% cellulose fiber. It was very high in wet strength and would normally contain some form of chemical additive to increase the internal bond strength. Introduction of synthetic fiber and latex was not considered until the late 1970's; therefore, in the early days, the sheet was very harsh and rough when compared with the medical crepe produced today. As the demand for softer and stronger material grew, the papermaker started to look at ways to make the sheet feel more like a textile than a paper product. All creping until then had been done on the paper machine, which by the very nature of this process produces a material with a harsh feel. Trials with off-machine processes were started using methods to soften the sheet, including embossing, calendaring and various other methods - with very little success.

Drapes and Gowns

Market demand in the medical paper industry was growing for even stronger and softer products. This demand led the mill to look at using synthetic fibers in the product finish. Synthetic fibers had been used for some time within the paper industry to manufacture various grades on inclined wire machines, but had not been used on a flatbed fourdriner machine.

Once again the mill entered into many hours of lab work and machine trials to produce the right product. The company worked with machine builders and clothing suppliers to obtain the correct formation and drainage in the wire part, as well as the required latex cure after the size press. As a result, the company produced a material that fulfills stringent requirements in terms of barrier function, strength properties and handle. This material therefore has very high tear strength, high burst and tensile strengths, and very good barrier efficiency, especially aqueous - as demonstrated by water repellency. It has a good resistance to alcohol-based solutions, as well as good drape characteristics with a degree of bulk.

"As the market has matured, the market leaders have been those who have focused both on manufacturing economies of scale, as well as continuous product improvement. Only those firms that are willing to go forward will survive in this market."

—Frank Hylands
former Plant Manager
Wycombe-Marsh

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The Wycombe – Marsh Mill received “The Queens Award For Technological Achievement” in recognition of their success with this project.



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The Process

The company then turned to the MICREX Corporation to carry out trials with its MICREX/Microcreper.

The first MICREX trials were not very successful. The MICREX machine did have a softening effect, but a large amount of dust was created, which would not be acceptable in a product for medical use. Also, the crepe pattern was very inconsistent. To overcome these problems and specifically to control the dust problem, Wycombe-Marsh made a major change to its base. Off machine trials were conducted in the mill's R&D lab, which discovered that adding latex to the sheet's surface not only eliminated most of the dust problem, but also greatly enhanced many other desirable properties of the base sheet.

The next hurdle was to transfer the surface addition of latex from the lab to the paper machine size press. This step proved challenging, as the size press mix at that time was very unstable and caused major contamination problems in the after dryer section of the paper machine. It took many hours of lab work and countless machine trials for the mill's technical and production teams to overcome this problem. The formula for the latex and the application method has always been a closely guarded secret and is still in use today. After solving the problem of applying the latex at the paper machine, trials continued with the MICREX/Microcreper. These were much more successful. The MICREX/Microcreper produced a sheet that was much softer, stronger and consistent in appearance, and as the production crews gained experience and grew in confidence, the product improved.

Results

The MICREX/Microcreper was successful in enhancing the sheet product in three areas:

1. Enhancing the aesthetic qualities
2. Adding extensibility and drape, functional characteristics which now define the product's performance
3. Achieving a unique look by utilizing a particular crepe profile to "brand" the product.

As a result of introducing the MICREX Process, the end use of medical crepe expanded to:

- Central Sterilization wrap, particularly inner wrap, for ward and theater packs, in conjunction with an outer layer
- All Purpose Central Sterilization Wrap, often used as an outer wrap for ward and theater packs, in conjunction with an inner layer

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MICREX is the developer of an enabling technology which imparts properties of softness/ drape and hand, stretch and extensibility, absorbency, bulk, pre-shrinking and decorative effects to nonwovens, films, textiles, papers, and composites. This technology — embodied in an expanding series of machine configurations known as MICREX®/Microcrepers™ — allows companies to dramatically expand the use and application for traditional and new sheet materials.

- Inner and outer wrap for small trays
- Sterile fields
- Inclusion in theatre sets and procedure packs [folded]
- Drape and gown over-wrap [supplied in sheets and rolls] sold to converters and kit packers/procedure pack assemblers
- Cost-effective linen replacement.

Features and Benefits

By adding drape and extensibility to the sheet product, The MICREX/Microcreper added the following benefits to the medical nonwoven:

Benefits:

- Appropriate wet and dry strengths for end use and requirements
- A level of air and fluid-borne bacterial resistance for its nominated applications
- Capability for sterilization by all known methods
- Biodegradability and disposability by incineration
- Non-toxicity, non-irritability, and virtually lint free
- Drape able, soft to handle, conformable

Features:

- Supplied in sheets, reels, counter reels folded, interleaved
- BS 5750[Part 2]/ISO 9002 approved
- Flame resistant, conforms to the USA Flammable Fabrics Act, Public Law 88 Section 4 [A]
- Lightweight linen-like appearance and feel
- Liquid resistant
- Some of the grades are used as a lamination base for conversion/lamination to plastics to produce trolley covers, Mayo Table Covers, under buttock drapes, back table covers and draw sheets.

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We wish to acknowledge Mr. Frank Hylands for his contribution to this case study. Mr. Hylands is the former plant manager for Wycombe-Marsh and is an acknowledged expert in his field. Mr. Hylands is retired and lives in England.

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