# Stretch leather - a fresh category of leathers with new opportunities

The properties of leather are being extended by combining leather with DuPont Lycra. Two new technologies which employ lamination of these materials have been investigated and developed by DuPont creating:

1. Additional functionality of recoverable stretch, highly desired in many consumer applications for leather.
2. New opportunities within the design, construction and comfort of footwear.
3. A new category of leathers for clothing, leathergoods, furniture and automotive use.

Lycra, first introduced to the textile industry in the 1960s, and firmly established in sports activewear, is now adding its high tensile strength with the ability to stretch and recover to leather, opening up even more applications for the fibre. It is worth reminding ourselves that it can be spun to a wide range of thicknesses and lustres, then either woven or knitted into a fabric. The thickness and weave of pattern, and the stress applied to the dyed and dried material during final heat treatment determine the elasticity and 'memory' of the fabric. This property is used extensively. If subjected to stress and high temperature (typically 170°C – 200°C), fibres and fabrics can be set into new configurations. After return to normal temperatures this new shape is retained, moreover, fabrics develop elasticity and the ability to rapidly recover back to the set shape.

## *Leather with Lycra*

The company's experience has now been applied to the foot, specifically to see if the shape retention properties and comfort benefits of Lycra can be extended into the footwear sector. Based on extensive wear trials in conjunction with SATRA, the subject of foot comfort in wear has been investigated against shape recovery. This is illustrated in Figure 1 which indicates the optimum comfort zone: above the zone there is

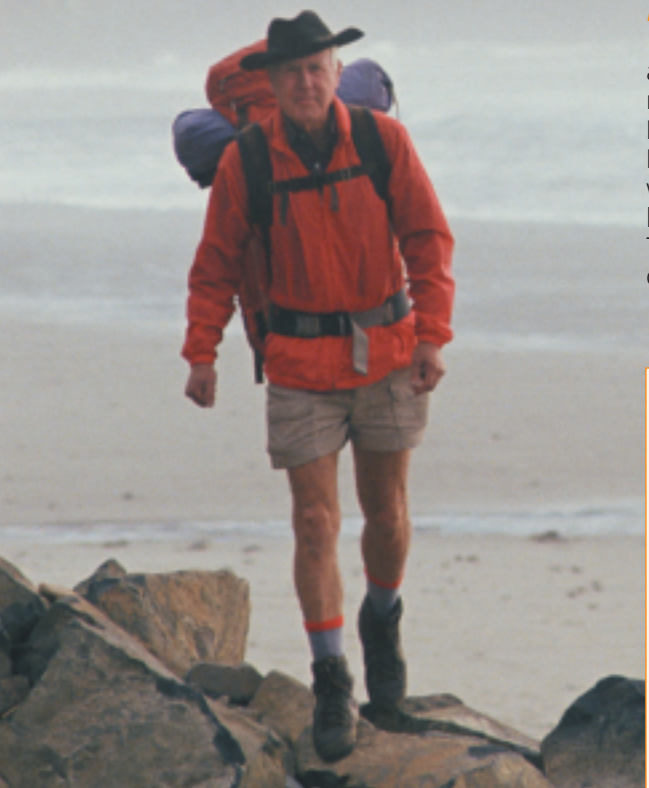


**Figure 1 Comfort in footwear**

*Standards based on extensive wear trials*

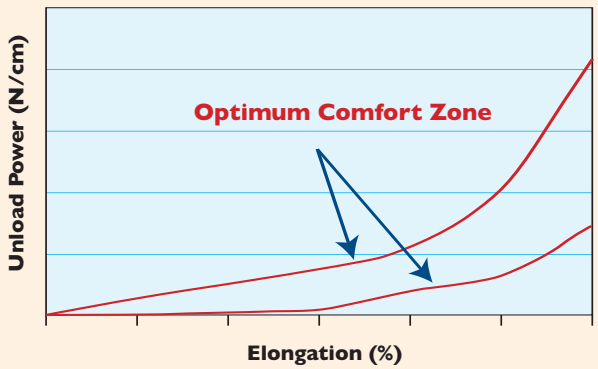
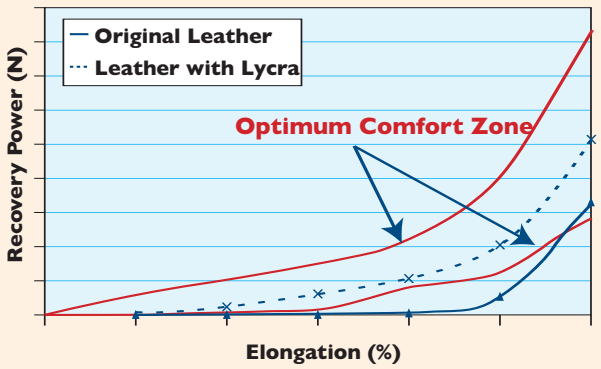
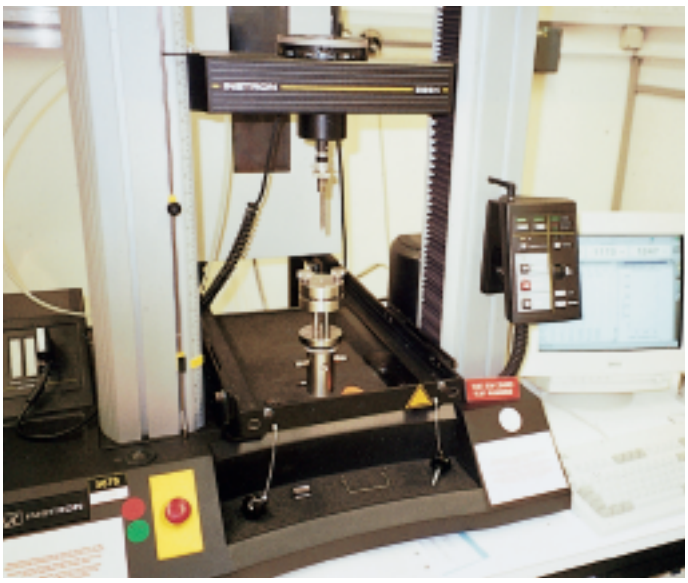


Figure 2 Material performance




*Leather stretches naturally but has no memory.*
** Lycra provides memory to leather while retaining its stretch*
** Lycra brings leather within the limits of comfort*



*DuPont has state of the art materials testing facilities at its offices near Geneva. In addition to conventional leather test equipment such as the flexometer, there is a specially modified Instron tensile strength machine. In addition to mechanical properties, such as tensile strength and tear load resistance, this machine can now plot the load - extension characteristics during the lastometer test, but under temperature ranges as low as -70°C to temperatures required for heat setting and lasting. DuPont is also employing unique capabilities to measure inside the shoe. Pressure sensors during a wear trial are applied to measure the pressure distribution in the foot. In addition, there is a 3D whole body scanner using high resolution laser technology, and this facility is further enhanced to demonstrate foot performance with leather/Lycra.*

**DuPont Worldwide - 2000 (before the most recent restructuring)**

DuPont operations span 70 countries over six continents - they include:

- 165 manufacturing and processing facilities
- More than 120 R&D and customer service labs
- $1.8 billion R&D budget
- Sales: $28.3 billion
- Earnings (from continuing operations): $2.73 billion
- Employees: 93,000
- Total assets: $39.4 billion

discomfort as the footwear is too tight, whilst below the zone the feel is too loose.

## *Building memory into high stretch leathers*

When leather uppers are used in footwear, other components provide support in the areas that are not subjected to stress. However, the stretch and shape retention properties of the upper across the front of the foot are key to foot comfort. This strip is immediately behind the toe of the shoe where it is supported by the inflexible toe puff. Leather used at this point can stretch - subject to the leather characteristics and substance - but the memory is insufficient for adequate recovery.

However, the aesthetic values of leather can be combined with the very powerful shape retaining properties of Lycra. In this event the properties of the leather need modification as the traditional stretch against load values need change.

There are two main requirements:

1. The leather making technology must produce a leather that can stretch far more easily than leathers used in traditional footwear.
2. The substance of that leather must be carefully matched with the stretch & recovery properties of the fabric substrate containing Lycra.

If these conditions are met, and the leather laminated with Lycra, the aesthetic properties of the leather are supported by new elasticity and shape retention values. In turn these values increase comfort level of the footwear. This is illustrated in Figure 2 where the values of elongation and recovery of a leather are lifted into the optimum comfort zone.

Within shoe construction these new high stretch leathers are clicked traditionally. Normal components used in footwear are employed in the sides of the shoe, heels and toe areas as these are not subjected to stress. However, where good recovery is now required by the easily extended upper, this predetermined value is provided by Lycra via lamination. For this application the product is supplied in a specified fabric already incorporating the heat activated adhesive. This technology of combining leather with Lycra called 'component lamination' has been patented by DuPont. The lamination step is performed in precut leather and Lycra components according to the shoe last and needs to follow specific guidelines such as consideration of the stretch direction of leather and the fabric.

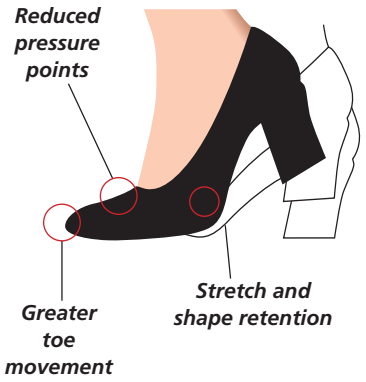
This form of construction can apply to a wide range of footwear for technical improvements in both shape retention and comfort levels.

## *A new category of leathers*

For uses other than footwear, the leather with Lycra hybrid has been extended to the lamination of whole hides or skins. The technique used is not new, but optimises the techniques and

**Panel 2 Benefits of Lycra component lamination applies to footwear in general**

- Better fit
- No "break-in" period
- Shoes retain their shape and appearance
- Wider fit ranges
- More toe movement
- Greater comfort at critical points (40% point load reductions per SATRA)
- Pinch points and hot spots are eliminated
- A more customised fit and feel




equipment used in other forms of leather/fabric lamination processes.

In this event, instead of a lower quality leather or split being used to provide physical support for a foil, or finished membrane, the case is reversed. Low substance leathers of all types - grain and flesh splits, full grain, nubuck and suede - provide quality appearance, texture and surface touch. Lycra provides the strength, form and shape retention, and this may also include leathers made from the middle split.

By laminating leathers as full hides or skins with the stretch fabric a new product has evolved. The aesthetic values are provided by split leathers at 0.2-0.4 mm, with the degree of stretch and permanent shape retention determined by Lycra lamination.

There are wide possibilities. Thin grain and suede leathers which would not normally be suited for clothing can become part of a new versatile high stretch fabric. The memory makes the product ideally suited to light weight garments and, as the lamination can be retained if the garment is washed, the garment fit and appearance is maintained.

## *Product development, support and licensing*

These innovative types of leathers need a different approach to manufacture. However, leather making processes have been developed to incorporate these new properties. Moreover, just as each tanner produces a leather with individual characteristics and features, the same can apply with the new leathers for component lamination in footwear, or for full leather/Lycra lamination.

The technology is therefore being licensed by DuPont: tanners manufacture their own product, but with product development, brand and technical support from the offices near Geneva.

For footwear applications, changes are needed in construction technique. Shoe upper constructions and lasting techniques have to be adapted to the new shoe construction. In this, too, the two-hundred year old multi-national DuPont also provides technology and brand support.

*Richard Daniels*