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## MANY USES OF PVC COATED POLYESTER YARNS

### INTRODUCTION

**T**HE INTRODUCTION OF PVC coated polyester yarns in woven and knit fabrics for industrial uses is having an ever-increasing impact on cotton and nylon and acrylic fabrics which were formerly dominant in certain industrial markets. It seems that prior to the introduction of these woven and knit forms with their breathability, the primary reason for the fact that the superior abrasion and soil resistance of the various plastic films had not yet fully reached their volume potential in seating areas dominated by conventional woven textiles has been the lack of comfort because of the zero breathability and the consequent discomfort after any lengthy period of sitting on those films.

The reasons for the continuing and increasing market penetration of the woven and knit PVC coated polyester yarn fabrics are many: (1) Vinyl which is about 75% to 83% of the weight makes the fabric quite durable in all kinds of weathering conditions. The vinyl also makes the fabrics crock resistant and easily cleanable and the material is self extinguishing in an era of more stringent laws concerning fire retardance. (2) Polyester core yarns give the fabrics excellent tensile and tear strength and the vinyl covering eliminates the UV degradation problems which uncoated polyester has in outdoor uses and, of course, the same problem with UV degradation would apply to cotton canvas or nylon fabric. (3) The fact that the individual yarns are coated before weaving or knitting makes for a truly breathable, comfortable fabric where seating is involved and excellent air transmission in other non-seating uses. Another important feature is that the fabric can be dielectrically sealed to itself or to another vinyl to eliminate need for sewing in certain end use applications.

We are currently making three standard sizes of PVC coated polyester yarns for weaving and knitting: First is .018 which has a core of 500 denier polyester with a ratio of 19% core to 81% coating and a

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yield of 2100 yards per pound with a single strand strength of 7 pounds. This yarn is used to knit and weave fabrics in a weight range from 8 ounce to 17 ounces per square yard for a very wide range of end uses.

The second is .025 yarn which has a core of 840 denier polyester with a ratio of 23% core to 77% coating and a yield of 1250 yards per pound and a strength of 17 pounds per single strand. These .025 yarns are used to weave a weight range of 10 ounces to 27 ounce per square yard in a wide variety of end use areas.

The third is a .030 yarn with a core of 1000 denier polyester with a ratio of 21% core to 79% coating, a yield of 900 yards to the pound and a strength of 24 pounds per single strand. This yarn is used in woven form primarily in a 17 ounce per square yard weight for sling type chairs both indoor, outdoor and marine.

These Textilene yarns are primarily consumed in our knitting and weaving operation but we do sell a small percentage to the manufacturers of braided electrical harness for heavy duty vehicles.

### **HISTORY OF DEVELOPMENT**

Perhaps at this stage a brief history of the genesis of these yarns might be in order:

We cannot claim credit for the idea itself as that really came from an Italian company which pioneered with the coating of rayon tire cord yarns about 1962 or 1963.

We became interested in the process in 1964 and secured the North American license for its production. We quickly came to the conclusion that greater strength and better economics in this country dictated the use of nylon instead of rayon as the core yarn and we made use of the name "Nyloplast" for the yarn we produced. We made the decision in 1965 to concentrate primarily as a yarn supplier to weavers who were already supplying some original equipment fabrics to Detroit and we worked jointly with them in the creation of a fabric using the .018 size yarns for original upholstery in the Ford pick-up trucks. It enjoyed about 3 years of popularity and excellent field results there but was phased out partly because of the comparatively high cost but more importantly by reason of the fact that Ford Motor Company themselves became the prime producer of slit knit vinyl fabrics. It doesn't take much imagination to realize what kind of competitive pressure that was!

During that period from 1967 to 1969 we engaged the services of Paul Letz, a noted textile designer, to create a color line and a weave which was directed at the casual and office furniture markets. It was a rather expensive construction and its use was only in very, very high price lines, but it did give some people an idea of the exceptional wear life and excellent breathability and comfort and relative easy care. At that time we were part of the Borg Warner Corporation, and there was still in effect the decision not to weave the fabric in our own mill, partly because it was felt that our looms were not suitable.

In April of 1971 when we became independent again, the decision was made to actively forward-integrate on that product line and create some weaves and fabric constructions which we would process from yarn through finishing and actively pursue the athletic, outdoor furniture and safety markets. Since 1971 we have made rather rapid and successful penetration of several markets formerly nylons and acrylics. It should be pointed out that we developed in 1971 a new and more economic process of yarn extrusion for which we used our trademark "Textilene" and did not take over from Borg Warner the license for the Italian process which they had in their possession at that time. It was that economic break-through, coupled with a few imaginative fabric constructions designed to meet market needs, which made possible the subsequent rather swift growth in these PVC coated polyester yarn fabrics.

## APPLICATIONS

### Wheelchairs For Paraplegics

One of the oldest and continuing uses of these fabrics solved a problem for paraplegics who were confined to possibly 16 hours per day in a wheelchair. To meet the low stretch requirements (it would be most uncomfortable and detrimental to have a fabric which would sag to any great extent) a rather unique weave structure was created and a very heavy fabric of 27 ounces per square yard using our .025 yarn size resulted, but it was one that still had great breathability. It permitted the wheeling of a patient into a shower where the water would flow through the seating, which then dried quite quickly and that same porosity made it possible for paraplegics to sit for hours without perspiring and the consequent irritation. The same construction in three

colors is being used today as was created for this 11 or 12 years ago. This is not a particularly large volume use but one which gives us a great feeling of usefulness and need-serving.

### **Breather Fabrics For Jump-pit -- Athletic Goods**

Not long after the wheel chair fabric came the more open weave, 14 X 12 count, .025 yarn, 12 ounce weight which became the standard fabric for the "breather" layers on the jump pits which made possible 18' pole vaults and 7½' high jumps without serious injury. This came into its own in the Mexico City Olympics and has since been used widely in secondary schools and colleges throughout the world. The fact that the yarns will "give" enough to permit enormous stress, and then return quickly to the original shape because of their remarkable memory makes this a most useful fabric, and since the cost of a jump pit is a rather sizeable expenditure, its long outdoor life is a key feature.

The same fabric in a 20 X 12 count has been used in a neutral grey color as the backdrop in the Cincinnati baseball stadium behind the pitcher in the center field area to provide better ball visibility for the batter. The same construction is used for wrestling mats and side mats in gymnastics.

### **Gym Divider Curtains**

We make a 10 X 10 count .025 yarn fabric for the upper portion of gym divider curtains above the opaque area to give excellent air circulation along with great strength and durability.

### **Fabrics For Infant Back Carriers And Fold-up Strollers**

In 1972, to meet a need for a lightweight, breathable and durable fabric which would withstand constant flexing and folding, we created a 17 X 12 count using the light .018 yarn which is still used on a great many of the "umbrella type" folding strollers. The same construction has found use as a replacement for vinyl coated fiberglass yarn fabrics in screening in collapsible tent units where its better flex life makes it desirable.

### **Safety Fabrics**

A knit structure using an .018 fluorescent orange or red color was

evolved about 1968 for use in safety vests for high visibility in daylight. The same vests, in some instances, have reflective strips sewed to them to give night visibility. The porosity of those vests made it practical to enforce wear even in the hottest climates whereas the unbreathable films in fluorescent color tended to make the wearer very comfortable. In a fairly short period of time, the State of Florida Sign Department found that the same material would make an excellent temporary highway construction sign. The primary reason for its success in that end use is the fact that it does not blow down as heavy trucks pass by at high speeds as is frequently the case with the rigid or non-porous signs. Also, these could be equipped with a collapsible frame and be folded up to take a small portion of the space in construction vehicles needed for the older type signs. These porous signs also require only 23 pounds ballast, compared to 75 pounds for the older type. This use has spread to Georgia, North Carolina and California and will no doubt grow rapidly as more and more highway departments are alerted to the benefits.

The same 10 ounce and 12 ounce knit weights are used in other colors for special police force identification vests. We recently learned of a use of a green color for signs for ski slopes which could be a rapidly expanding market.

### **Lawn Mower And Sweeper Safety Bags**

A knit construction similar to the 12 ounce highway sign material in white is made for use in an industrial lawn sweeper bag because it has such excellent outdoor life, good impact, resistance due to knit structure, ease of clean up and good sewing qualities.

### **Cushion Cover For Outdoor Furniture**

About 1972 occurred the first fairly large scale use of a 17 X 14, .025 construction as the covering material for bulky comfortable outdoor furniture on a plastic pipe frame created by Landes on the West Coast, and they named the fabric "Tuff Stuff". This was used on rather high priced furniture so the market was somewhat limited at that time, but so was production and it worked out well for all concerned. The field results were excellent and acceptance grew. It was learned that with the porosity and comfort of breathability came another dividend in that the cushions would dry out fairly rapidly even after exposure to

rain. About two years later, one of the major producers of cushions in Florida decided to replace his canvas, unbreathable vinyl and nylon coverings with this Textilene, primarily for the hotel replacement pad market, and it would have to be said that the real explosion in usage of Textilene type fabrics dates from then. They were put in the lines of several of the high quality casual furniture manufacturers in the Southeast and by the middle of 1977 became a dominant factor in that use area, with manufacturers throughout the world, and the growth rate this year is on the order of 40/50%. New earth tone colors and checks and tweeds have brought it into use in den furniture as well, which broadens the market penetration greatly.

### **Sling Type Furniture**

In 1974 a special size yarn and more open weave was created to meet a need on a new type sling furniture brought out by Samsonite. This was an .030 yarn with 1,000 denier polyester core to give a minimum tensile over 200 pounds per inch in the fill direction and 270 pounds in warp direction on an open mesh  $18 \times 10$  construction. This was to replace and look as open as a flat bed knit polyester they had put on the initial pieces of this furniture and the polyester without vinyl coating was not satisfactory. This sling fabric was an instant success, and the construction has since been used in many other ways and is a large volume item.

The same construction is in use in some new K-D (Knock-Down) casual furniture units and we can foresee much wider use of it as knock-down becomes more popular in view of ever mounting freight costs due to energy problems.

### **Sun Umbrellas**

A comparatively recent development is the use of these fabrics as sun umbrellas, using a  $17 \times 14$  or  $17 \times 15$  count, .025 yarn size, the same as that used for cushion covers.

One of our customers with more customer need know-how than we possessed, apparently was struck one day with the thought that beach umbrellas are not generally sat under in the rain and therefore the fact that one had some porosity would be no drawback so long as the shade factor was adequate. He proved to be very right, and the  $17 \times 15$  count apparently has about 90% to 93% shade factor; and provides some very

useful characteristics to a sun umbrella. For one thing, the porosity makes it cooler underneath its shade than under an unbreathable vinyl coated fabric umbrella. For another, the same porosity makes it more stable in a heavy breeze, permitting the wind to exit and not balloon or blow over. Moreover, it is now possible to match the color and pattern with the cushion or sling chair fabric. Its rapid growth in use for these umbrellas involves much yardage as it takes about 6 linear yards of 54" or 58" for today's umbrella over a table and chair set. The same reasoning regarding the porosity might apply to awning, giving shade without trapping hot air and if so, that would open up a very large market and an added advantage would be the fact that the stripes or check would not be prints which could be lost with wear, but colored through and through and last the life of the fabrics. There has been some use of a green color as a complete patio cover in the area around Houston, where the fabric's porosity to permit rain through only as a fine mist instead of huge drops tended to protect delicate plants and at the same time provide adequate shade in that hot area.

### **Seating In Crop Duster Planes & Helicopters**

We have been providing modest yardages of a 20 X 12 count, .025 yarn fabric to Piper for use as a sling seat in crop duster planes where its comfort, ease of cleaning and self extinguishing character and strength made it very useful. For helicopter seats in training planes the same fabric used for wheel chairs has proved quite satisfactory.

### **Catamaran Trampolines**

Both the 17 X 14, .025 and 13 X 10 .030 yarn fabrics are being used successfully as the trampoline area (seating or standing area) in Catamarans made on the West Coast and on the East Coast where their porosity makes them more comfortable, less apt to change stability of the craft, and permit rain or wave water to dissipate immediately. Add to that, long outdoor life and its utility for that end use area is quite apparent.

### **Safety Rail Cover In Houseboats And Large Yachts**

The 13 X 10 count fabric has found use as a replacement for canvas as the safety rail material on houseboats and large yachts. It provides great strength to keep young children from slipping through the rail

area and overboard, and at the same time, visibility is excellent, color is good and outdoor weatherability at a level unobtainable in most fabrics. Also for this marine use, its resistance to fungus and mildew growth because of built-in Ventron compounds is a real advantage.

### **Office Furniture**

A construction of 19 × 15, .025 yarn, somewhat heavier than casual cushion covering, is used on office chairs where the manufacturer wants a surface which will be extremely long wearing and enable the one sitting in the chair to be comfortable and not soaked with perspiration in a multi-hour meeting. Some conference room chairs made 11 years ago, which have daily use, show no signs of wear or color change and are as useful as they were 11 years before. Obviously, it is not as luxurious looking as a wool or linen, but for comfort, long-life and ease of cleaning it shows up well.

### **Some Applications of Textilene With Dielectric Sealing**

Textilene fabric, being composed of a coating of virgin vinyl extruded over a core yarn, can be dielectrically or electronically heat-sealed either to itself or to a vinyl film. Some of our customers such as the baby stroller manufacturers find it more economical to seal the fabric to itself in that manner rather than by traditional sewing methods.

A major problem in electronic vinyl sealing are holes, weak spots, and tears. In many cases, these can be minimized by inserting a strip of Textilene between the two vinyl films being sealed. The core yarn in our material reinforces the seal and effects a very tough bond which is much stronger than a seal of two or three layers of film alone. This is particularly true in those applications in which the vinyl film is relatively thin.

Since the Textilene strip is not exposed, scrap fabric or seconds or material made of obsolete colors may be utilized. A similar application on heavy duty sling seating, such as that in airport lounges, makes use of our SM-757 in brown as the back and seat reinforcing element, and companies such as Leatherforms in North Carolina and the Wood Works in California are using it in that manner.

### **Dump Truck Covers**

Many states in the U.S. and some provinces in Canada have laws

which require the covering of dump trucks with a cover to restrict spillage of loads on highways. Where those are enforced, an open mesh fabric in a 14 X 12 construction .025 yarn has been found to be most satisfactory. It permits air to go through preventing ballooning of the cover, and at the same time the mesh is fine enough to restrict spillage. The extrusion coated yarns in a fabric weighing approximately 12 ounces per square yard apparently last much longer in field use than a plastisol dipped scrim of weights from 6 ounce to 8 ounce. The primary reason for this is the fact that the usual ratio of core to coating on the extruded yarn is 80% vinyl 20% core, whereas on the dip-coated plastisol, the ratio is usually 50% vinyl to 50% core, and under constant flexing, the extruded yarn holds up much longer in field life.

### Solar Shades

A market which is only in its infancy, but which appears to us to have enormous potential is an energy-conserving window shading system which employs some fabric woven in varying densities from our .018 size yarns. It is called the Mecho Shade System and has been developed by Joel Berman Associates in New York City and we have created an *exclusive* group of fabrics for them which they use in their own fabrication, and they will also sell all the components, including fabrics, to other contractors. Briefly, it is designed to insure environmental comforts for people at a window wall by reducing heat gain in summer and heat loss in winter with the overall benefit of reducing energy waste in these days of ever-increasing energy costs and the coming crunch on fossil fuels. When one thinks of all the window-wall buildings which have been erected in the past several decades which will have to be retro-fitted to conserve energy, the number of shades in the potential market is staggering, and we can visualize this as being perhaps our largest yardage market by 1984 or 1985.

### Miscellaneous Uses

Other uses which are rather minor in volume are the 13 X 10 count, .030 yarn fabric in an accessory bag for scuba divers, and fabrics like the office furniture construction as a breathable sport shoe upper; and a cane-like weave now used as seat and back panels for a rocking chair. I'm sure there are others which our imaginative customers have not revealed to me, but from the catalog we have already given, you can see that the fabrics which are being made from PVC coated polyester yarns have a remarkable number of diverse uses.