

# The Use Of Heat Setting As A Surface Design Technique For Polyester Fabrics And Its Applications In Commercial Lifestyle Products

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## Abstract

Fabric has the power to humanize our living environment. Textiles have always had an ability to demarcate space, absorb sound and create decorative elements. With these characteristics, it is not difficult to explore the full potential of heat setting on polyester as a decorative surface design technique.

Utilizing the heat setting properties of polyester, a range of fabrics has been designed and applied within the use of interiors. Within the interior context, fabrics' potential uses include: upholstery, to cover furniture; to cover cushions; curtains, blinds and other forms of window drapery; as bed linens and table linens. Fabric may also be applied to walls, like wallpapers, in panels as screens or partitions. Fabrics can also be designed into light shades and even a lighted partition.

This paper will focus on the use of the heat setting technique on polyester fabrics; with its thermoplastic qualities, polyester fabrics can be pleated and moulded into 3D structural forms. The process of heat setting will be discussed and how these heat set polyester fabrics are further developed into applications within the commercial lifestyle range will be explained. The potential of the heat setting technique, with its inherent flexibilities and its capacity to be moulded and given a 3D form has created vast possibilities in the area of interior fabrics and products.

## Keywords –

- *Fabric Manipulation*
- *Heat Setting*
- *Pleating*
- *Moulding*
- *Lifestyle Products*
- *Furnishings*

## Introduction

Heat setting on fabrics is a technical approach of fabric manipulation that provides a platform into some of the most creative and innovative approaches to surface and textile design. This technique enables a flat fabric to be transformed into structural and sculptural forms. The creative process of pleating, crushing as well as moulding continues to evolve into different possibilities and hence creating this range of interesting surface designs that can be applicable to various creative interiors and lifestyle products.

Generally, textiles create mood, they envelop us and stimulate our sense of touch. This range of heat set fabrics, with its tactile quality, not only draws the attention of one's eyes but the hands too. With its multiple functionalities, they can be hung on walls or under a ceiling as sculptures; be framed as screens and as panels in front of windows; as curtains; as cushions and light shades. Heat set fabrics can be extremely versatile in its presentation.

During the process of developing the heat setting fabrics, the exploration of combining the heat set fabrics with resin-encapsulated technology has further enhanced the overall creative result. The method of fabrics

encapsulated within resin has proven to give more applications and commercial viability to the heat set fabrics. The outcome is a more solid piece of translucent acrylic laminate bearing the subtle nuance of the decorative heat set fabric interlayer.

The development of the set heat fabrics has culminated as a set of functional and decorative textiles applications, under the label of "Tactile Textiles". "Tactile Textiles" is intended, to inspire the user to interact and play with the series of tactilely created fabrics. Making the users feel warm, not only physically but also emotionally and aesthetically; with each different and unique fabric manipulation techniques, adding three-dimensionality to our living space and allowing users to touch and understand the fabrics.

## **Methodology**

### *A. Heat Setting*

"All synthetic fibres will melt at a certain temperature, but below this point they will often heat set into a different form. By tying, stitching or clamping fabrics into folds before heating, various features can be created."<sup>1</sup> For this range of heat set fabrics, I have chosen to work on 100% Polyester organza, georgette, crepe and netting fabrics. Polyester belongs to the group of Synthetic Fibres. Some other examples of synthetic fiber group include Polyamide, Acetate, Acrylic, Viscose and Elastane. Polyester is thermoplastic, that is, it can be transformed through heat into new configurations, which on cooling is completely stable.

The definition of Thermoplastic is as follows: "Quality of a fibre whose molecular structure breaks down and becomes fluid at a certain temperature, making it possible to reshape the fabric by pleating, moulding, vacuum-forming or crushing. The fabric is 'fixed' on cooling and cannot be altered unless heated to a temperature greater than the one at which it was reshaped."<sup>2</sup> This three-dimensional surface structure is hence permanent and it can be maintained even with washing in cold water.

One of the most innovative fashion designers who use the heat setting technique is Issey Miyake. "Issey Miyake is fascinated by the transformation of a two-dimensional, flat and inanimate fabric to the moving sculptural form it becomes when worn ... and Issey

Miyake explore this by pleating horizontally, vertically and diagonally ... Texture and form are created simultaneously using this process which reacts with the memory of the fabric, resulting in permanently pleated garments."<sup>3</sup>

The few methods of production used in this series of work are pleating, crushing and moulding. When these techniques are combined with each other, the overall creative result can be enhanced. The production methods of the techniques will be discussed in the following sub sections.

### *B. Technical Production – Pleating and Crushing*

"In simple terms the pleat is a double or multiple folding in a garment or other item made of cloth. Traditionally, pleats are measured folds formed at the edge of a piece of fabric where they are secured with stitching. Beyond the stitching, they become loose folds that continue the arrangement set at the edge. They are released in sharply creased order through heat and pressure."<sup>4</sup> Pleating is mainly done by the use of machines with the help of paper pleat patterns to secure the fabric to the desired pleat. Pleating and folding methods varies and each variation of a pleat has been named to distinguish them as specific techniques. The most basic is the accordion pleats; some other variations include box pleats, knife pleats and honeycomb pleats.

The 2 combined techniques used in this series of work are random pleating and crushing. Crushing is a more random way of pleating and the creases on the fabric gives an overall random texture and pattern. Stitching on the fabric or gathering of the fabrics can achieve the crushing effect. Crushed fabrics will then pass through heat and pressure; the randomness of the way the fabric is crushed becomes the decorative focus in this fabric.

It is easy to create pleated and crushed fabrics in a home studio setting. The polyester fabric can be sandwiched between 2 sheets of aluminum foil and then folded into desired pattern and heat set. The aluminum foil helps to traps the heat onto the fabric as well as secures the folds better. Fabrics can be placed into microwave, or even a baking oven for the heat set process.

Both pleated and crushed fabrics can achieve strong aesthetic results whether the fabric faces upwards or downwards. The duo-

sided quality gives flexibility to the products such as the screens and dividers that has been designed, to showcase both sides of the fabrics.

### *C. Technical Production – Moulding*

Moulding of the fabric creates structural surfaces on the fabric. Moulds of different shapes and sizes can be used to provide the three-dimensional effect of the fabric. One easy approach is to apply simple ‘shibori’ techniques, by using a binding technique; glass marbles can be tied to the polyester organza. Then fabric can be placed into the microwave or oven for the heating process. Once heated, fabric will adhere to the form of the marble mould, which is below the melting point of the fabric. Once the fabric has been heat set, the marbles are removed. This creates an amazing textural, rounded and three-dimensional effect to the fabric. This structural design can be customized to one’s liking, whether it’s done closed together or further apart, it creates a different form with each individual fabric.

Shibori is a centuries old traditional Japanese textile finishing technique. It involves the tying and folding of a fabric before the dyeing process. This technique is originally used on silks and plant fibers, which leads to unique patterns, textures, structural forms and colours after the dyeing process. On natural fibres, the three-dimensional effect will not be permanent. However, on synthetic fibres such as polyesters, when treated with the shibori technique and heat, the fabrics will result in a permanent three-dimensional surface.

Moulding is a very flexible technique that can be applied to achieve both basic and complex designs, either singularly or combining it with pleating and crushing. This permanent heat set is lightweight and versatile, the fabric has limitless potential applications within the home interiors and lifestyle products arena.

## **Results and Discussion**

The heat set fabrics, with its flowing flexibility and softness can be utilized within our interior spaces. These fabrics, being used as cushions, upholsteries, screens, dividers, light shades and wallpapers can determine the ambience of our enclosed space. Interior furnishings and fabrics must be durable, easy to clean and colour fast. These range of heat set fabrics which have been designed into

cushions, light shades, screens and dividers have the above mention qualities which makes them suitable to the applications.

### *A. Cushions*

Sofas and chairs are inviting spaces within our living area and cushions serves not only as a decorative accessory, but also give comfort to the users. “Cushions can be classic and stylish or frivolous and just plain fun ... Cushion covers must stand up to much handling, therefore sturdy, good quality fabrics will ensure durability. This is a realistic attitude to take and it is wise economy to use the best fabric you can afford because if you are going to spend valuable time making them yourself, you don’t want them to fall apart sooner than expected from normal use.”<sup>5</sup>

The range of cushion covers designed mainly uses the moulding method of heat setting, hence producing a tactile quality that invites the users to touch, stroke and play with it.

The inspiration of the structural three-dimensional shape comes from natural and organic elements. Hence a range of names is given to these different shapes that evokes the natural organic patterns of the nature. There are five styles of fabric formations, namely: ‘meanders’, ‘floras’, ‘shrooms’, ‘stalacs’ and ‘bubbles’.

The ‘meanders’ are made from rows of repeated pleats and when the user pulls the pleats apart, it will crinkle and form meandering patterns. ‘Floras’ are made from flat constructed round disc shapes, of varying sizes, which reminisce an oriental coin with a hole in the middle, known as 筒 (tóng). ‘Shrooms’ are made from flat constructed round disc shapes. ‘Stalacs’ are done by the shibori style of stitching and binding the fabrics into mini cone shapes. Lastly, ‘bubbles’ are also created by the binding method, by tying marbles onto the fabric.

These three-dimensional forms not only conjures the imagery of the natural elements but also intrigues and induces the users sense of touch, These shapes, with the texture of the organza fabric, feel interesting to caress and massage over the user’s skin.

I am also working on another set of research project using this range of heat setting fabrics. The project will focus on the therapeutic abilities of tactile textiles for the use of the

elderly in a Singapore. The main aim of the project is to use tactile textiles as a form of therapy for the elderly; especially those with deteriorating senses. Its focus is to stimulate the sense of touch. Also with the use of embedded technology and using textiles as a base material, a series of textile based equipment with tactile surfaces responding to the patient's sense of touch and sight is being developed.

As one of the common consequences of aging is a decline in motoric function and the ability to learn motor skills, patients will be able to practice their hand-eye coordination on the material and hence a necessary therapy in enhancing their motor skills. The use of embedded technology incorporated into these textiles will allow patients to experience a different sensory altogether. The main objective will be to incorporate and weave both tactile qualities with the SMART technology seamlessly. With the outcomes of the experimentations, a series of visually stimulating and interactive set of materials can be designed for the patients. The design enhancing the patients' motor skills will be prototyped and tested by the elderly in the Eldercare centres in Singapore.

### *B. Lampshades*

Lampshades add elegance and beauty to the lighting in any home décor. Creative innovations in lampshade lighting can beautify the bedroom designs. Apart from serving to decorate the room, lampshade lighting also augments the comfort to set in the perfect ambience for relaxation.<sup>6</sup> The main functions of a lampshade are to soften the light from the bulb and reduce the glare; and the lampshade gives a better decorative appearance that infuses creativity to the home décor.

All the five fabric formation styles used in the cushions range are applicable to the lampshades; double layers of the fabric are used to minimize the glare from the direct bright light source. The colour range selected is mainly vibrant and warm colours that can enhance the ambience of the space when it is lighted up.

The beauty of these different styles of lampshades is in its different three-dimensional forms. Being illuminated through the sheer organza fabric, it not only enhances the organic shapes but also add of dash colour through the aesthetic lampshades through casting beautiful coloured shadows. The use of organza add soft

textured layers; creating layers of translucency within the lighting.

### *C. 2-Fold Screens*

Applying textiles to a folding screen can create decorative intimate ambience when natural light peeks through the sheer textiles. Whether it is used as a space divider or a backdrop, folding screens accentuate our living spaces.

The five fabric formation styles are not applied onto this range of 2-fold screens, instead the machine pleated and crushed techniques are used. The main reason for this is the limitation of the moulding technique. When being applied onto a longer length of fabric, the three-dimensional forms may sag and lose its structure. Hence, a flat textured fabric will work better for screen sizes that are above 1 metre. This range of pleated and crushed fabrics can be combined with other surface design techniques such as top stitching, heat transfer printing, thermal bonding, digital printing, devore and laser cutting to create a more intriguing surface texture and aesthetic appearance. In this range of 2-fold screens, there are 2 sets of the similar fabric done in the same technique. When displayed, it can be versatile, as it is lightweight; users can place the 2 sets side by side, or place them in any angles. It can also form a column, or even as two separate pieces.

The use of metallic coloured organza such as copper and silver in this range of screens enhances the look and feel of the design. When pleated and crushed, these metallic fabrics give an attractive sheen and sparkle to the overall effect. When natural light comes through the fabrics, shadows are cast onto the floor, which change in tint and shape, depending on the time of the day.

As written by Chris van Uffelen in his book *Fine Fabrics*, many interior designers and architects are fascinated with the new uses of textiles as a material for both interiors and exteriors of buildings. "The designers strongly believe that soft materials make interactions between people and spaces more human, and have proved that textiles can play a crucial role in architecture with the hope that the material's influence will increase in the near future."<sup>7</sup>

#### *D. Wheeled Dividers*

Dividers work nicely around homes and offices where privacy is preferred. The use of textiles as a room divider can “provide a sensuous and evocative means of modulating light.”<sup>8</sup> In this series of work, dividers are created not just with the use of the heat set fabrics; the fabrics are being laminated by the use of ‘Resin Encapsulated Technology’.

I was introduced to the 3form company during their launch of the ‘Creative Challenge – Materials Competition’ in Singapore. “This company produces materials for the architectural and design community. 3form prides itself in providing resin products for design and construction and they have successfully created and introduced environmentally friendly, affordable, safe and cutting edge designs to the market. The EcoResin product line is brought to life with sandwiched interlayers of fashionably crafted colors, textures and patterns. The variety in this line of products is so stunning it captured international acclaim in the first year of the company launch.”<sup>9</sup>

3form was founded in 1991 with a vision to create design-driven materials with an unyielding commitment to environmental responsibility. In 2007, 3form became part of the Hunter Douglas Group and now has operational centers in the Europe and Asia and the USA.<sup>10</sup> For the Ecoresin range, 3form allows their clients to customize their product; the client can choose the interlayer, customize a colour and choose a surface finish to the panels. The actual size of a full panel can be of length two metres by height one point five metres and thickness two centimetres.

I worked with 3form Singapore to test out a few sample pieces of heat set encapsulated fabrics with EcoResin and the result has opened up a lot of possibilities in the potential of the heat set fabrics being applied in hard furnishings.

The heat set fabrics from moulding, pleating and crushing are all being tested for the initial sampling phase. The heat set fabrics from moulding category, having a fuller, three-dimensional structure and form resulted in thicker cast of about three to four centimetres. Thus, the weights of these samples are already posing as design problems if these panels are to be used as dividers. However, other applications within the interior space, such as feature walls, counter tops or furniture can be

possible. The flatter pieces of heat set fabrics from pleating and crushing styles works best with EcoResin. For the full panel size, the flatter heat set fabrics can conform well to the size standards.

There are several numbers of companies within the industry working on similar ‘Resin Encapsulated Technology’. Lumicor is an American based company; “Lumicor allows architects and designers to create memorable spaces with these eco-friendly architectural resin panels encapsulated with texture and colour. The aesthetic and functional products offer endless possibilities for simple and practical ways to bring light, texture, colour and inspiration to any space. Utilizing this patented technology, Lumicor creates eco-friendly resin panels using recycled resin and sustainable materials, including organics from nature, metals, fabrics, colour infusion and the firm’s own unique designs. Lumicor panels are offered in acrylic and additional specialized resin options to suit applications.”<sup>11</sup> Another company, S Plasticon, from Greece, also provides similar products. Their range, Imaz, allows clients to choose finishes such as ‘Sand’, ‘Frost’ and ‘Gloss’. In Singapore, I have found two companies who are also working with the similar technology. Getz Bros. & Co. Singapore has their ‘decorative translucent panels’ named as ‘Lumiart’ and AGlass Singapore named their ‘natural-organic translucent panels’ as 3Art.

I worked with AGlass for the final wheeled dividers as they have the most competitive price points. The heat set fabrics has to be joined to appropriate lengths before sending in for the encapsulating process. The first piece is done with the box pleating process, and strips of coloured fabrics are joined as panels before pleating. The second piece is done by the random crushing effect and it consists of 4 joint pieces of heat set fabrics formed by crushing. Birchwood frames these translucent resin panels and two wheels are connected at the base for the ease of moving the large dividers around.

The dividers are not only decorative, they serves its purpose to demarcate functional space within our living environment. It can also perform its function as natural light filter, to diffuse off the glare from the sun. These dividers look astonishing with back-lit lights, as the textures of the heat set fabrics are more prominent and the details of the pleats seems more defined.

## Conclusion

Textiles have always been present in our living spaces and it defines the mood within our interiors. The applications of heat set fabrics as commercial lifestyle products used within the interior space have its potential within our living environment. With the different technical variations in the heat setting techniques, the heat set fabrics can create a dramatic and tactile effect, transforming the space they are used in. As written by Dimitris Kottas in the book 'Materials Innovation & Design': "More and more textile materials are being used in interior architectures as textiles stand for comfort and emotional quality and determine the quality of one's stay in interiors."<sup>12</sup>

The flexibility of the heat set fabrics has allowed various applications, not just limited to soft furnishings. It can be combined with other material surfaces such as the 'Resin Encapsulated Technology' to create limitless possibilities within the interior or exterior wall facets to add softness to our built environment.

To conclude, the range of heat set fabrics as interior fabrics are not just pretty patterns, exciting visual and structural forms starts to emerge as a result of the fabric's thermoplastics qualities. Here's a quotation from the book, 'Textile Designers – At the cutting Edge' by Bradley Quinn; which sums up the essence of the paper and the presentation: "As recent developments in the field of textiles present new technical abilities, their applications in fashion, architecture and interior design have re-defined them as a uniquely multi-disciplinary field of innovation and research. As today's textiles change how the human body is experienced and how the urban environment is built, they reveal their capacity to transform our world dramatically."<sup>13</sup>

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