Distorted patterns – no more problems*

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There are a number of textiles – patterned carpeting, woven and knitted fabric, lace, terry or parasol cloth for instance – that are either exceedingly difficult to detect, or not at all, using conventional techniques, and, as a consequence, cannot be straightened. To attempt to realign such fabrics to the weft or course is either a futile excercise or an impossible one up to now.- Terry cloth, lace or patterned carpeting were hitherto undetectable,or only to a certain extent.

Measurement of a design repeat

Another frequent problem with patterned material, especially carpeting, lace or parasol fabric, is the continuous measurement of design repeat. It is virtually impossible to do this manually whilst the line is running, consequently the production line has to be stopped in order to take a random measurement. An absolutely uniform pattern repeat – the distance between two successive repeat patterns – is essential, however, before the carpet is laid or patterned material is made up, therefore there is a real need here to continuously monitor, control and record output.

Measurement and control of pattern repeat is yet another widespread field of employment for the PCS Pattern Control System.

Here again, Mahlo is the "solver of problems"

Mahlo® had already noted this trend many years ago, and addressed the problem. The thought of designing an alternative way to the conventional one of monitoring bow and skew first took root with the advent of an advance in camera technology. The resultant system would offer the following facilities:

- automatic on-line detection and control of bowed and skewed patterns
- automatic measuremnt and control of lengthwise and crosswise pattern repeat, continuously and with sustained accuracy, and
- the progressive recording of all essential data.

The first corner-stone was laid at the end of the nineties with the introduction into the textile and carpet industries of the PCS Pattern Control System. It effectively forstalled complaints against pattern-distorted cloth or out-of-tolerance repeat.

Applications, to name but a few, are:
- carpeting
- towelling
- lace, net curtaining, table cloths
- jaquard knitted qualities

Product description

The PCS Pattern Control System is basically an image processor, the result of many years of research and development in camera technology. It is able to detect bowed and skewed patterns, monitor lengthwise and crosswise design repeat and cloth width, record all data, and control, for instance, a Mahlo Orthomat (weft straightener) as well.

It is modular in construction, and the basic assembly comprises

- an image-recording module (one or more cameras),
- a light module, and
- specially designed software (including visualization and control-interface).

In common with other Mahlo® systems of the 10A generation, the information required to run it (ie. control commands, system settings, fabric-related data etc.) is simply fed into the system via the touchscreen monitor.

Specially designed cameras, and a compact lighting unit minimize the amount of space required to integrate a PCS Pattern Control System into established processing lines. The specially constructed, ultra-long life light fitting requires little attention, whilst the uniform amount of light it provides right across the on-line fabric guarantees excellent, pattern-related images.

Monitoring pattern repeat

A PCS requires a repetitive series of patterns on the fabric to enable it to provide measurements of any significance.
In the picture recorded by the camera, the Mahlo-designed software first seeks a well-defined part of the pattern for analysis. It then proceeds to look for all the other patterned areas resembling the first one. The system is then able to establish both lengthwise and crosswise design repeat.

Detecting bowed and skewed patterns

To be able to detect such distortions requires
a repetitive pattern across the cloth, which repeats itself every few running metres
a repetitive, linear structure across the cloth (border or cutting trace) or
a pattern that extends from one selvedge to the other.
The degree of bow and skew is then calculated in much the same way as with pattern repeat.

Line analysis, a well researched and designed procedure, tracks cross-web lines, and establishes the degree of bow and skew from the resultant contour.

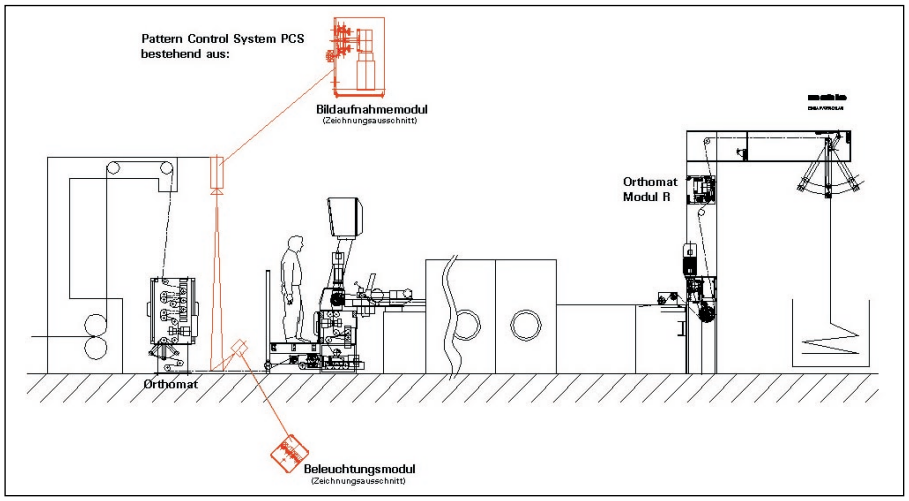

Fig. 1: Pattern Control System with incident light and associated Orthomat straightener

A further highlight is the "Teach-in" function, which can detect a pattern extending from one selvedge to the other. Without any manual intervention whatsoever, the system "learns" the location of well-defined, patterned areas, how they are arranged in relation to each other, and memorizes the associated bow and skew configuration. Should the pattern recur, the system will find the stored patterns again, and compare the one in relation to those memorized.

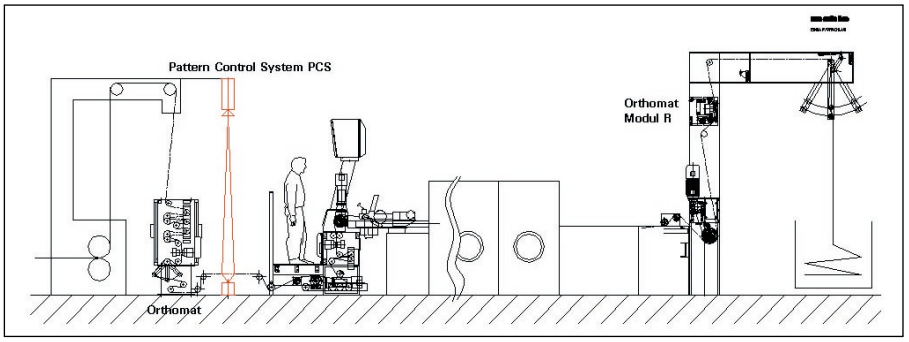

Fig.2: Pattern Control System with back light and associated straightener

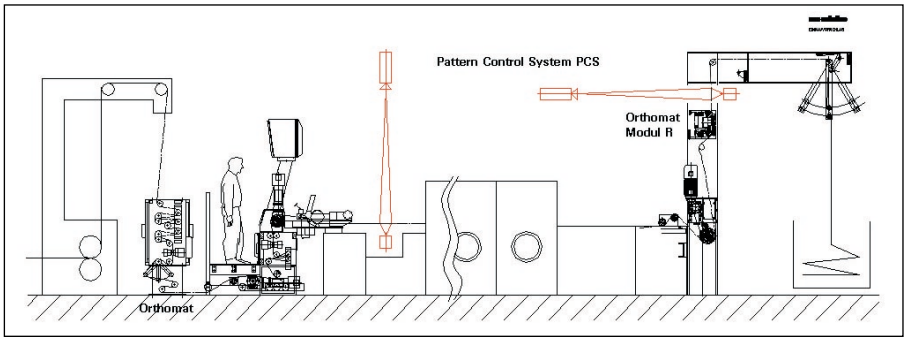

Fig.3: Pattern Control System monitoring design repeat (controlled overfeed)

Detection of bow and skew (pattern straightening)

- ***Bordered towelling***

Practical experience has amply demonstrated the fact that bordered towelling can be detected only with the greatest difficulty by the sensing techniques available at present. The weft in terry fabric is obscured by the loops, and is thus exceedingly difficult to "see" and straighten.

In this case, too, the only way is to automatically realign such material with a Pattern Control System.

The borders or cutting traces serve as a reference point to determine the degree of bow and skew. These connecting links are perceived as lines by the PCS, and are used as a basis for calculation of bow and skew and control of the Orthomat straightener.

To get the best possible results, the PCS should be located as close as possible to where the cloth exits the Orthomat straightener (Fig.1). The close proximity of one to the other considerably reduces the dead time between detection and Orthomat straightener response and, consequently, the portion of cloth that slips through only partially straightened or not at all. A further bonus in the quest for a quality finish.

(Pattern control system PCS, comprising:)
(image recording module)
(light module)
enlarged enlarged

- ***Net curtain and lace***

Hitherto, the only possible way to straighten bowed and skewed net curtaining and bordered lace was by hand. Automatic detection of such textiles by conventional means brought very little in the way of satisfactory results.
In this field, too, the Pattern Control System has satisfied all expectations.

In common with printed cloth, the best results here are achieved by locating the PCS as close as possible to the Orthomat straightener (Fig.2). Any bow and skew detected by the PCS will be rectified automatically by the straightening machine.
The machine operator no longer needs to intervene manually, and can concentrate on other important procedures.

- ***Printed carpets***

The PCS Pattern Control System enjoys a wide-ranging field of activity in the printing and carpet manufacturing sectors.
If such carpeting is straightened prior to being coated, it will show no subsequent tendency to relax. To detect and realign cross-web patterns with a Pattern Control System be efficient.

A PCS, however, can monitor the pattern for possible bow or skew, and control an associated Orthomat straightener.

Pattern repeat

- ***Control of pattern repeat on bordered curtain (lace)***

When finishing bordered curtaining (lace), the most essential requirement is an ever-constant, lengthwise repeat at the feed end of a stenter. Up to now, this could only be achieved in part by taking random but not always accurate measurements from the on-line material.

Figure 3 illustrates an installation, on which design repeat can be measured, and the overfeed roller controlled automatically to a specific target setting by a PCS Pattern Control System.

• **Carpets**

The Pattern Control System has found a niche of ever-increasing significance at the final inspection stage of carpet manufacturing, where each separate roll of carpet is measured manually for lengthwise and crosswise repeat, finished width, and any bowed or skewed pattern, and the readings recorded, likewise manually (Fig. 4).
Up to now, such data could only be obtained by stopping the inspection line in order to take these random measurements.

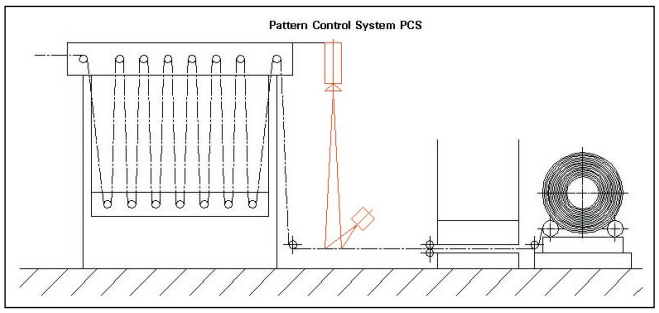

Fig.4: Pattern control system for carpet inspection and data logging

By taking advantage of a Pattern Control System, they can be taken continuously, automatically, and with unfailing accuracy from start to finish of the entire batch of carpeting.

It can also print out a full record of the various readouts (proof of finished quality), and the information it contains can be of invaluable assistence when it comes to laying the carpet, particularly if it has to cover an appreciable area, and the pattern is rich in contrast.

Summary

A PCS Pattern Control System provides an automatic, continouous, on-line means of detecting bowed and skewed patterns, and monitoring design repeat.

Fabrics of every description, many undetectable up to now by conventional techniques, can now be straightened automatically according to the pattern by a PCS. The record it can provide of all essential readouts makes all the more lighter the work of subsequent processing or making up. Automation thus forges ahead into areas that were hitherto the sole preserve of personnel.

The additional features of PCS, such as
– continuous measurement of cloth width, along with the potential to automatically adapt to sudden changes in width
– storage in recipes of fabric-related parameters, and
– its facility enabling link up to a higher-ranking control system, provide still further benefits.

These, and not forgetting the"Teach-in" function, reduce even more the already minimal operating costs.

The, at the time, unique method of measurement, the result of experience gathered over a period of 5 years in the field of camera technology, the unceasing efforts of research engineers, and the special Mahlo software opened up unexpected opportunities for the PCS, even in allied industrial sectors that could never before be turned so effectively to good account.

* Source: Melliand Textilberichte 3/2002