



# Corrugating Industry – Controlling Warp

Moisture, Temperature, or Both for Control?

Key Words: Warp, flatness, moisture control, temperature, curl

Warp control in the corrugating industry is a constant challenge, especially when temperature and humidity vary in the manufacturing environment.

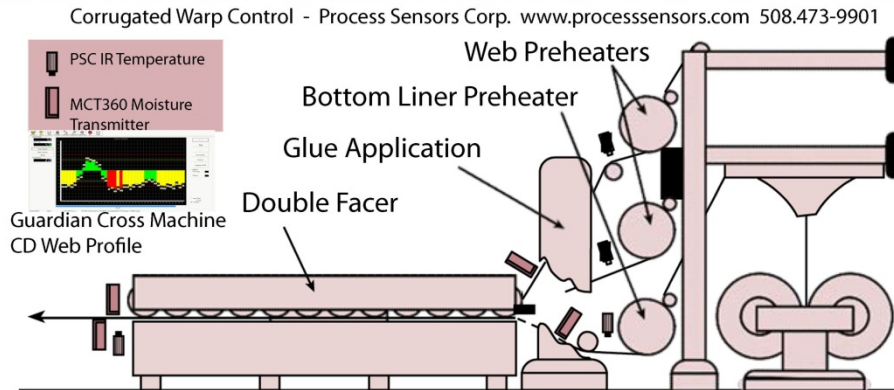
Cross Direction (CD) warp is when the top and bottom liner board moistures are not matched and it is the largest contributor to board quality. If the top and bottom liner board moisture levels are unequal after bonding, the variance in shrink rate will cause warp. Machine Direction (MD) warp can be caused by moisture variations between the top and bottom liners and tension control.

Many corrugators turned away from Near IR moisture transmitters to less costly, simple temperature measurements for control of warp. This approach has been found wanting, as there is a poor correlation between temperature and paper moisture. Temperature or heat control schemes alone do not account for web speed variations or paper moisture variations between rolls and sometimes even within the same roll. And paper moisture is the key parameter in controlling CD warp. The higher the moisture content, the greater the paper shrinkage when dried via the preheater. Moisture impacts glue penetration and warp.

Perhaps it's time to revisit the approach and utilize a combination of moisture, temperature, and tension to control warp. Accurate tension control of both facers is recommended using load cells and PID control of pneumatic unwind brakes. Temperature contributes to both good glue penetration and glue curing. Moisture addition is typically done with either a Liquid Application System (LAS) or a Steam Re-Moisturizer.

The advent of economical Near IR moisture transmitters and IR temperature thermometers provides a solution for controlling liner moisture prior to the double facer operation to improve warp control and flatness. In fact, transmitters are now available that measure both moisture and temperature within a single housing. If the location of these measurements are not the same, separate transmitters are sometimes required. A typical corrugating line illustration is shown below.

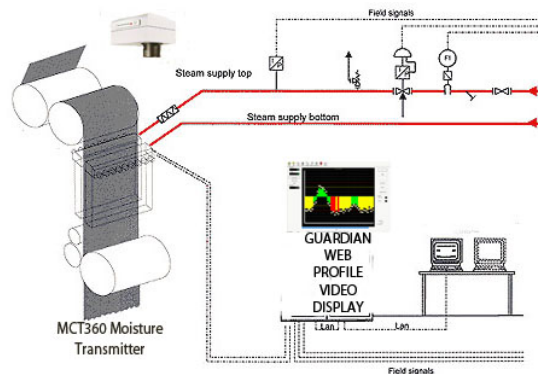
## Diagram I: Corrugated Warp Control Outline



## Re-Moisturizers

Liquid Application Systems (LAS) and Steam Re-Moisturizers are often used to increase the moisture level. The output of the Near IR moisture transmitter is used to control the applicator roll speed in the LAS system and to manually adjust skew and pressure. The Guardian CD Web Profile zone averages the moisture readings to correspond with the zones in a steam curtain, typically 4 to 8" each. These zone averages are used to control the individual steam actuator valves in each zone. A typical steam re-moisturizer outline is shown below.

## Diagram II: Steam Re-Moisturizer Control



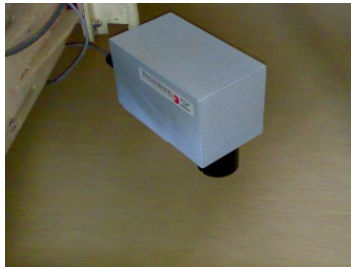
## Configuration Options

The power and price of computers, consoles, and transmitters today have significantly lowered the capital investment required to improve warp control. The approaches include stand-alone moisture transmitter, transmitter mounted on simple auto/manual scanning frame, and the Guardian CD Web Profile System.

### Stand Alone MCT360 Moisture Transmitter

The MCT360 NIR Moisture Transmitter is accurate, rugged, and reliable. The transmitter mounts between 6 and 16" from the web and provides digital display, Machine Direction MD trend, analog outputs for control, and digital output for data archiving.

**Picture I: MCT360 NIR Moisture Transmitter**



**Picture II: MCT360 Operator Interface Digital Display And Trend**



## MCT360 Moisture Transmitter On Auto/Manual Scanning Frame

The MCT360 is mounted on a low cost auto/manual scanning frame. The operator can set it for automatic scanning across the web or jog the transmitter to a fixed position for Machine Direction trending.

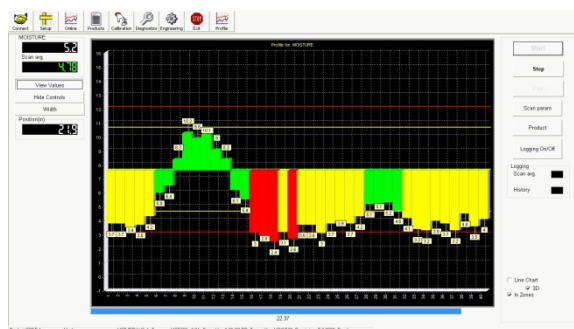
**Picture III: Low Cost Auto/Manual Scanning Frame**



## Guardian CD Web Profile System for Moisture Or Coating

The Guardian CD Web Profile System provides a Cross Direction web profile on a 19" flat panel LCD in an economical and attractive enclosure. The Guardian is fully automated with recipes for web width, scan speed, zone average, and data logging digital outputs. This is a complete system to provide the highest value performance to cost ratio. The system can supply CD Web Profiles and MD Trends for moisture and temperature. Multiple measurements can be mounted on a single screen.

**Picture IV: Guardian CD Web Profile Display**





**Picture V: Guardian CD Scanning Frame System**



**Picture VI: Local Operator Console**



[Click Here to view Guardian Brochure](#)

[Click Here to view Guardian Scanning Frame Operation](#)

[Click Here to view MCT360 Moisture Transmitter Brochure](#)

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## Summary

Warp Control and Flatness can most reliably be achieved with the incorporation of moisture transmitters into the control scheme.

Please contact us at 508.473-9901 to discuss your application today.