

Temperature Measurement on the Corrugating Line

using Calex infrared temperature sensors

- Accurate web temperature measurements from small, robust non-contact sensors
- Install a new system, add sensors into an existing system, or replace existing sensors at a fraction of their original cost

Temperature control is critically important in corrugated board manufacturing. It helps ensure a strong glue bond between the layers of the corrugated board, and provides an indication of the board's moisture content.

With proper temperature control, defects in the board such as curling, puckering, blistering and a weak glue bond can be prevented, ensuring a high-quality finished product.

The infrared temperature sensors manufactured by Calex Electronics are ideal for this purpose, and are now being used with excellent results by leading manufacturers of corrugated board around the world.

Fast, Accurate Measurements

A sensor is aimed at the web at several locations on the corrugator. The response time is extremely fast - less than a quarter of a second - and the sensor gives an accurate surface temperature reading regardless of the speed of the web or the measurement distance.

Corrugated webs almost always have a high emissivity (around 0.95), so it is easy to achieve excellent results with a simple, low-cost temperature sensor, such as the Calex PyroCouple, and the measurement angle has little or no effect on the accuracy.

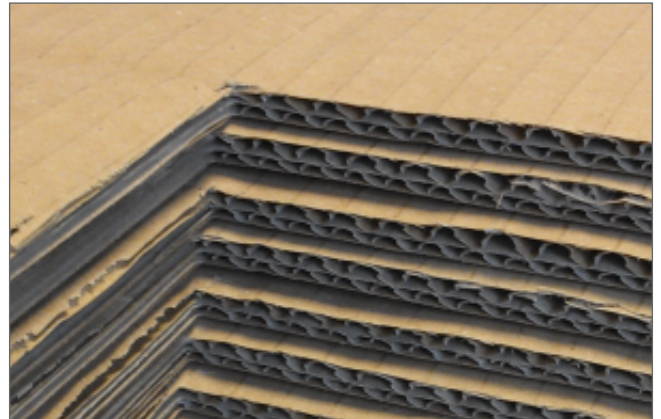
The temperature readings may be used to automatically control the corrugator: for example, the position of the wrap arms on heating rollers may be adjusted to control the amount of heat transferred to the web, and the speed of the web may also be controlled.

In some locations, especially for thin liners, there is little or no temperature difference between the top and bottom surfaces, and a single sensor to measure one surface is sufficient. However, for single-face webs and boards, the top surface temperature could differ significantly from the bottom, so a pair of sensors may be required to measure both surfaces at the same time.

Optics

The sensor measures the average temperature within a spot, and the size of the spot depends on the optics and the measurement distance. In most locations, the web is wide and it is possible to measure a large area, so the low-cost 2:1 optics are most commonly chosen.

The sensor must have a clear field of view, with no obstructions. If machinery such as wrap arms could obstruct the field of view, narrower 15:1 or 30:1 optics may be more suitable.



Typical Measurement Locations

Single Facer (or Module Facer)

A paper medium is pre-conditioned with heat and moisture before being moulded into a fluted pattern by corrugating rollers, then glued to a flat liner to form a single face web. One single facer is used for single-wall corrugated board, or two for double-wall board.

Measurement Locations:

- Temperature of medium after preconditioner, before being fluted by the corrugator rolls
- Liner temperature between preheater and gluing
- Fluted medium temperature between preheater and gluing

Triple Stack Preheater

Another liner is introduced, along with one or two single face webs. All are pre-heated by steam-heated rollers to the optimum temperature before glue is applied in the glue unit.

Measurement Locations:

- Single face web temperature between triple stack preheater and glue unit
- Liner temperature between triple stack preheater and glue unit

Double Backer

The liner and glued single face webs are combined to form corrugated board.

Measurement Locations:

- Single face web temperature between glue unit and double backer
- Liner temperature between glue unit and double backer

Hot Plate

The liner and glued single face webs are combined to form corrugated board.

Measurement Locations:

- Single face web temperature between glue unit and double backer
- Liner temperature between glue unit and double backer

Keeping the Lens Clean

Corrugating machinery can be a very dusty and humid environment. An air purge collar is usually used on each sensor to help keep the lens clean and dry for maximum accuracy.



PyroCouple sensor with air purge collar (left) and cooling jacket (right)

High Ambient Temperatures

For locations where the ambient temperature exceeds 70°C, such as in the single facers, PyroCouple and PyroBus sensors are available with an air cooling jacket. The air supply is connected to the cooling jacket inlet, and the outlet is then connected to the air purge collar.



PyroMini sensor with optional local display

PyroMini sensors are available with a high-temperature sensing head that withstands up to 120°C or 180°C without cooling.

Choosing a Sensor

For connection to existing instrumentation

Calex PyroCouple sensors are available with a choice of analogue outputs for easy connection to an existing system. 4-20 mA, thermocouple, or millivolt output options are available.

[>>](http://calex.co.uk/pyrocouple)

Alternatively, the PyroBus and PyroMini may be connected to existing RS485 Modbus networks.

[>>](http://calex.co.uk/pyrobus)

[>>](http://calex.co.uk/pyromini)

For new temperature measurement systems

The corrugator line could be up to 150 metres long, so to minimise the cost and complexity of cabling, a network of PyroBus or PyroMini sensors is usually preferred.

A single network bus cable runs along the length of the corrugator, with sub-networks of up to 6 sensors connected to it via junction boxes.

Each sub-network of sensors monitors temperatures on a section of the corrugator, such as a single facer or the triple stack preheater, with a PM180 providing local temperature display, alarm visualisation, and (optionally) logging to MicroSD Card for quality assurance.

[>>](http://calex.co.uk/pm180)



PM180 temperature display and logging unit with 6 PyroBus sensors

Related Applications

Wrap Arm Position Control

The wrap arms on preheat rollers control how much heat is transferred to the web, and should be aligned parallel to the heater roll to achieve an even heat transfer across the width of the web.

By monitoring the temperature at at two points across the width of the web, then as well as controlling the amount of heat being transferred to the web, the parallel angle of the wrap arm may be adjusted automatically without the need to manually measure the distance.

Bearing Temperature Monitoring

Monitoring the temperature of the bearings of critical rollers in the corrugator can help predict failures, plan preventative maintenance and avoid costly downtime.

The above sensors are ideal for measuring the temperature of painted bearing housings. Contact probes are subject to vibration and must be replaced as they wear out, however non-contact sensors can be mounted separately to avoid this.

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