2D F-SENSOR

INNOVATION FOR PAPER - ON-LINE FORMATION SENSOR

AN ON-LINE FORMATION SENSOR IN TWO DIMENSIONS

The Purpose

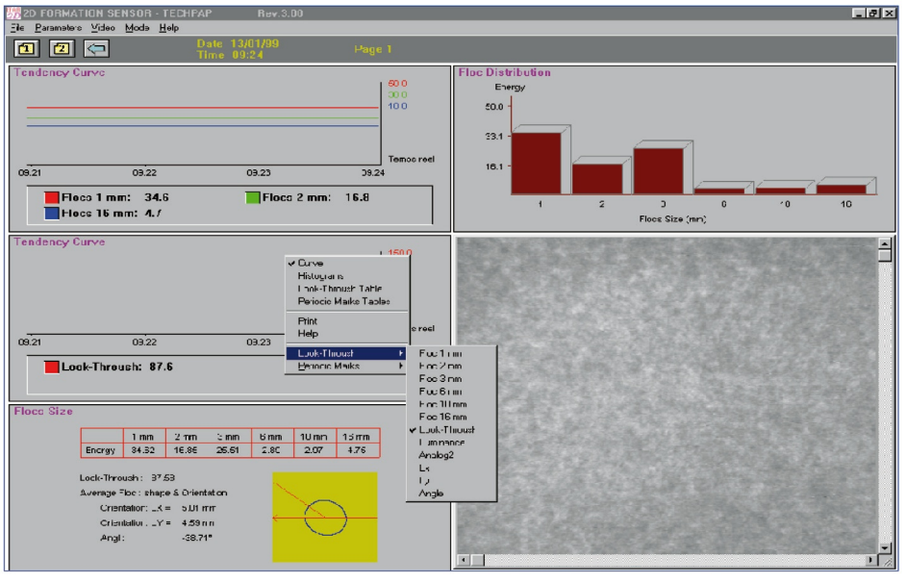
A well controlled sheet formation is necessary to ensure optimal physical characteristics leading to product quality, PM runabilty and reduced waste. To evaluate sheet formation, the paper maker needs to have good visual control, as well as a maximum of information about floc size distribution, floc anisotropy, periodic marks and trends. Centre Technique Du Papier (CTP) and Techpap developed a new 2 Dimensional On-Line formation sensor based on current video analysis technology. The system is now successfully installed and operational on many paper machines throughout the world.

The Principle

A CCD camera takes images of the moving sheet which is backlit with a LED stroboscope. The images are transmitted to a PC for processing. This PC controls sensor operation and performs the algorithmic analysis. The operator interface gives a continuous image of the sheet, data trend curves, histograms, data arrays, periodic mark information and other relevant paper formation data.

The Measuring Head

The measuring head assembly is a ruggedly built U frame designed to fit from the side of the web. This U frame is composed of a central support to hold the cooling controls and to provide structural support. There are two anodised aluminium tubes attached to the U central structure, the top tube is used for the camera mount and the bottom is used for the strobe mount. This measuring head assembly can be installed on a bracket before the finish reel on the back side of the PM or just in front of a coater with the measuring area about 70 cm from the sheet edge. Emitting and receiving heads are cooled with air and water. An electrical control unit is mounted close to the head assembly and connected to a control computer in the control room.



The Computer

The computer is a high speed industrial PC, running under the WINDOWS 2000 or XP workstation.

This PC performs the algorithmic treatment of the transmitted images. This algorithmic calculation is the result of 20 years of experience from CTP and Techpap Engineers in the field of formation index development. The Windows OS offers an excellent platform to perform these calculations as well as a user friendly and efficient means to display the output.

By using a 4-20mA signal or an OPC server, the formation index data can be sent to the DCS or to a data historian on the mill network.

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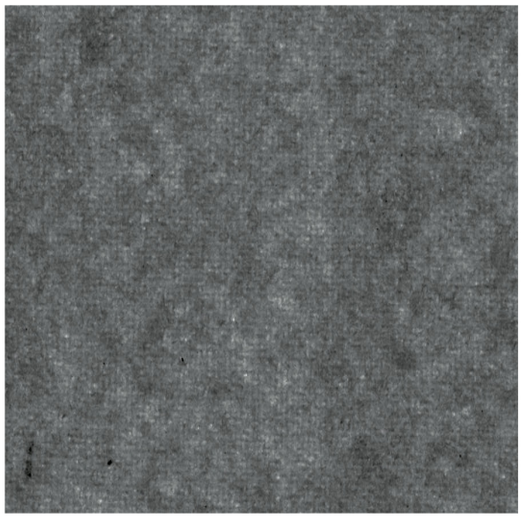


The following results are displayed on the PC screen:

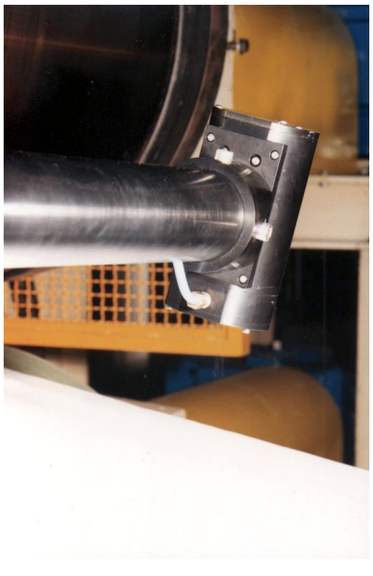
> A large look-through image of the backlit sheet.
> A global formation index number with strong visual correlation. (This system also correlates well with the Techpap On-Line Laser Formation Sensor.)
> Floc size distribution in 6 classes (1, 2, 3, 6, 10 and 16 mm) given as histogram and curves.
> Average floc size.
> Anisotropy of the average floc.
> Flocs orientation angle.
> **Periodic marks:** The 2D F-sensor allows the user to follow simultaneously 3 periodic marks simultaneously. The periodic mark calculation includes mark intensity, angle and spacing. With this system it is easy to check the intensity of the laid lines or laid paper, as well as identifying roll, wire or felt marking. It allows the paper machine operator to anticipate felt changes when a felt begins to mark the sheet.

IN SUMMARY

With the 2D On-line Formation Sensor the operator immediately sees the benefit of any change on the machine parameters because the data is being collected directly on the machine. The interface is easy to use and clearly understood. The screen can be customized to display any variable of interest and with the sheet visualization the operator is instantly aware of information that is not readily available from the data.

In summary the 2D F-sensor is:

> A ready to use on-line sensor (the equipment is pre adjusted and tested for immediate installation before it leave the factory).
> The perfect tool to facilitate on-line control of a paper or board look-through (formation).
> An instrument that can help control PM or fiber line adjustments to affect not only look-trough formation but floc size distribution, average floc angle, floc anisotropy and average floc size.
> An efficient way to track periodic marks on your paper or board (shadow marking, web mark, and felt mark).



Measurement

* Measured Area	4.75" x 4.75" 120 x 120 mm
* Measurement Frequency	2 images / second
* Analysis Area	1.7 m² / min 18.28 ft² / min
* Basis Weight of the Sheet (Depending also of Opacity)	15 to 300 g / m²
* Resolution	250 microns
* Repeatability	< 1 %

Sensor

* Weight	100 Lbs. (45 kg)
* Dimensions in Machine Direction	3.94" (100 mm)
* Total Length	39.37" (1000 mm)
* Total Height	39.37" (1000 mm)

Electric Control Unit

* Dimensions	11.81" x 15.75" 300 x 400 mm
* Maximum Distance to Sensor	20' (6 m)
* Distance to PC: Cable Length	328' max (100 m max)

Displayed Results

* Sheet Image
* Formation Index, Flocs Size (1, 2, 3, 6, 10 and 16 mm), Angle and Anisotropy Lx, Ly of Average Flocs
* Periodic Marks: 3 Marks, Angle, Intensity, Minimum Spacing 0.5 mm

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