

RGB-colour based web break detector

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ABSTRACT

With the increased speed of modern paper machines, open draws are more often replaced by closed draws – the paper web runs on top of wires or felts. These fabrics come in different colours, the contaminants from the paper change the surface colour of the fabric, and the optical reflectance characteristics of the fabrics change with time. This is a big challenge for conventional optical web break detectors which use a single wave length for the detection. They require regular maintenance and often retuning when there is a new felt or the colour of the paper is changed.

Each missed break at a 1600 m/s machine generates a tremendous amount of broke to be cleaned out from inside the machine causing considerable production loss.

The web break detection signal is usually connected for PLC / process control, machine monitoring and quality reporting. A missing web break or incorrect web break triggers incorrect information and causes further problems. The modern paper machines require fast and reliable web break information.

A new fibre optic web break detector utilises RGB-light source (Red-Green-Blue) for detection to overcome the above mentioned reliability issues. The detector sends a Red, Green and Blue light on the measurement spot.

The detector is designed to handle all of the break detection applications. The fibre optic cable isolates the light source and the electronics from the measurement environment, expanding the applications to the high temperature sections of the machines, as well as to highly humid conditions. The unique air purge arrangement keeps the sensor's fibre optics clean in dusty and steamy locations, eliminating maintenance. The small size of the sensor head allows for installations in very tight spots inside the machines.

CONVENTIONAL WEB BREAK DETECTORS

Traditionally, photo cells have been used for web break detection. They perform satisfactorily in applications where visual contact from one side of a machine to another side can be arranged and where the ambient air is clean. Photo cells require continuous attention, cleaning and maintenance.

IR-based fibre optic break detectors have been used in difficult applications and in cases where the web is supported by fabrics. The disadvantage is that they cannot separate between web and red wire or felt.

NEW DESIGN FEATURES

Kajaani Process Measurements Ltd. has developed a new web break detector for demanding applications. The new KB web break detector has RGB light source for colour measurement. The best of the colours R(red), G(green), B(blue) or combination of them can be selected for the break detection for each application. The break detection becomes reliable even with different fabric colours. The user can monitor the colour readings and trends and then choose the optimal triggering levels for break.

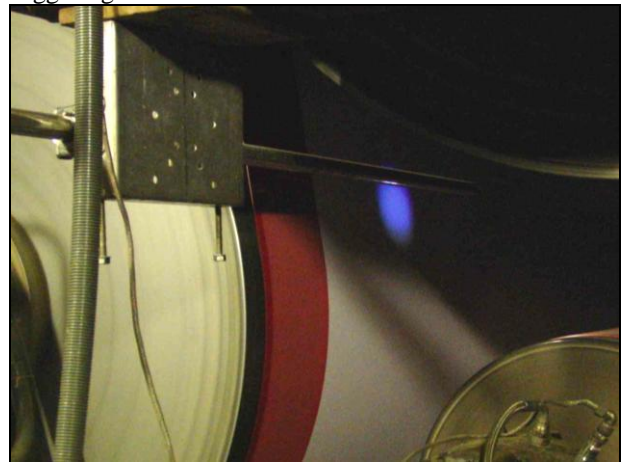


Figure 1: KB web break detector in the dryer. The felt colour (red in this case) does not affect reliability.

The KB Detector is inside a stainless steel rod and does not have any active electronics inside probe. Internal air purge keeps its window openings clean. No regular cleaning is required. In case of problem KB Detector gives a maintenance alarm.

KB web break detector utilises proven high temperature resistant fibre optics which also makes it usable in hot environments, such as at dryer sections of a machine. Air purge arrangement expands applications to very humid, hot and dirty locations.

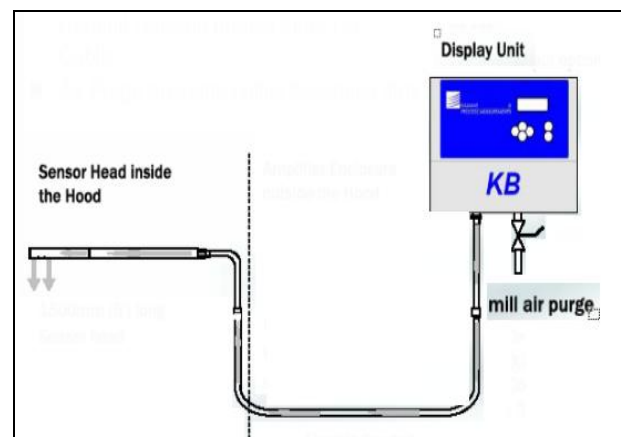


Figure 2: KB Detector system

Optical signals are run through the fibre optics cable to the local control box where the electronic signal receivers are located. The local display makes it possible to access the break detection signals, calibrations and set up parameters.

MAINTENANCE TOOLS

StoraEnso, Oulu Mill has more than 10 web break detectors at the PM6, originally delivered with the machine over 10 years ago. Regular adjustments have been required to keep the break detectors working reliably. In some applications, the edge of the fabric has been painted black to improve the performance of the break detection. Many of the original detectors have been replaced by KPM's KB detector.

At PM6, the KB web break detector is set up to use the blue colour for measurement, which gives the most reliable break detection between the white web and the red fabric behind it. The signal difference between the paper and a break is very clear.



Figure 3: Local control box

The self-diagnostics of the KB break detector system is continuously monitoring the raw break detection signals and a sending maintenance alarm to the user if the signals have reduced to the maintenance alarm limit. If the detector is in maintenance alarm mode, it is unable to give break alarm to avoid false break alarms. These nice features give operations and maintenance technicians time to do the maintenance work without worries about false alarms.

APPLICATIONS:

The most common application is free draw where there is only paper web and air behind.

The much more demanding applications are where there is a need to detect the paper web on the felt. Traditional IR web break detectors only work for some applications due to limited detection performance. The RGB based KB web detector can detect different colours and then separate wire/felt reflection easily from the paper web signals.

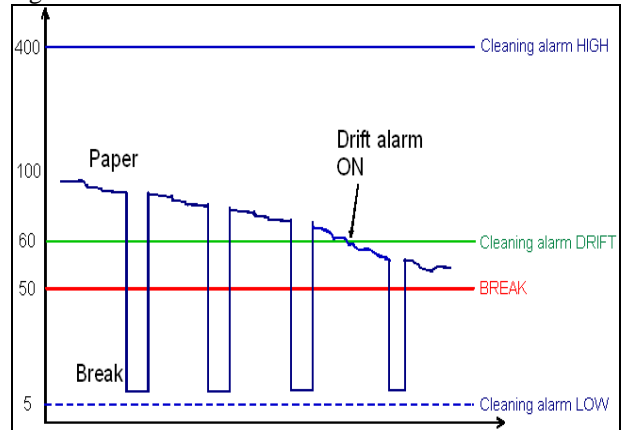


Figure 4: Maintenance signal and alarm

SUMMARY

Modern RGB based KB web break detectors are used in many paper and board machines to detect web breaks.

The key features and benefits of the modern break detectors

- Led light source RGB colour detection
- Detects against "air", felt and roll
- Detects colour changes in web, felt or roll
- Easy and quick to start-up and maintain
- Reliable sensing head for harsh conditions
- Fast web break signal processing
- Applicable for hot applications (up to 180 °C)
- Modular and small size construction
- Self-cleaning sensor head
- Safe working at the remote display
- Low cost installation
- Analog output signals to DCS trending
- Optional computer software

Reliable break detection is the key aid for paper mill operators in optimising the production and machine uptime by getting accurate and reliable break information to paper machine control and monitoring.