

PIN-HOLE DETECTION

CUSTOMER BENEFITS AND GAIN DECISIVE ADVANTAGES

Ø HIGHER QUALITY

- § Guaranteed Quality Assurance
- § Reduced Customer non conformity and material loss

Ø EFFICIENCY / ACCURACY

- § Accurate detection on high-speed running strip
- § Ambient light immunity

Ø RELIABILITY

- § Specific design and ruggedness for severe environments
- § Easy installation

Ø AVAILABILITY

- § Lower maintenance cost and time by using components with a long lifetime
- § Less down time at the processing line

APPLICATION

Sheet metals used for the food packaging are produced by companies from the steel and aluminium industry. Sheet metals are manufactured using rolling mills to stretch the raw material and form a steel sheet of some tenth millimetres of thickness. The stretching process of sheet can induce a lack of homogeneity of the metal structure and form holes.

The most critical defects are very small holes called "pin hole" existing on strip dedicated to food and liquid packaging. These holes can not be detected visually.

In order to detect those defects, Arck Sensor offers an automatic detector named CEPHEE using the "dark room" principle.

The strip of metal to be controlled is placed in a dark room with a specific lightening going through the holes in the metal in order to activate ultra sensitive photoelectrical sensors.

The amplified and shaped signal is then compared with a threshold of tension to deliver a digital information "Everything or Nothing" and temporarily calibrated.

This alarm is delivered to line process system and allows to detect which part of the metal sheet is defective.

CEPHEE detectors detect, at a run speed of 700 m/min, holes of diameter 10 µm ; and at 1 000 m/min holes of diameter 15 µm. The width of measurement is up to 1 455 mm.

LASER TECHNOLOGY

The principle is based on the use of a laser beam as a light source and of high sensitivity photo sensors suited for the reception of the light through possible holes in the metal sheet.

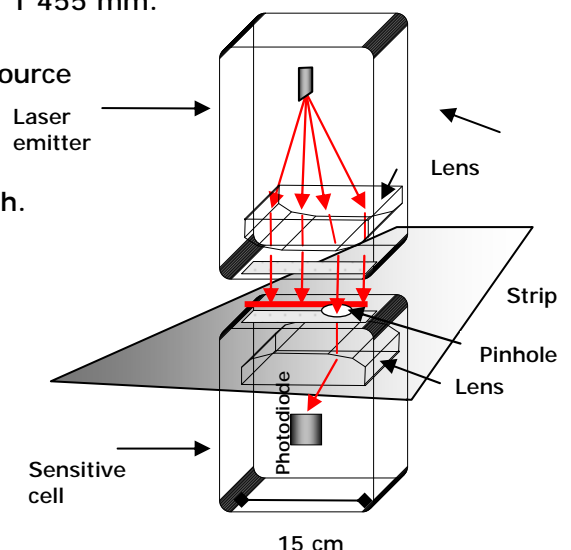
Considering the size of holes and to avoid the use of hypersensitive sensors, the emitted light energy must be high. The use of a laser source meets this requirement.

A laser diode of some mW produces a high energy source because the power is condensed into a very thin light spot. The original beam is made divergent to sweep the detection zone using a line generation lens. The original beam is made divergent to sweep the detection zone using a line generation lens.

DETECTION PRINCIPLE

The strip to be controlled in real time is of a maximal width of 1 395 mm and can be moved of 30 mm on both sides of the median axis, what gives a width to be watched of $1\ 395 + 30 + 30 = 1\ 455$ mm.

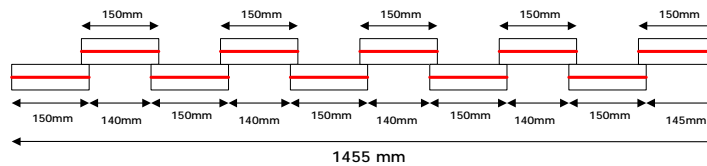
It is necessary to focus in a vertical direction the light beam produced with the laser line. Light going through the pin-hole is then re-focused towards the photodiode.



PIN-HOLE DETECTION

For technical reasons, an optical module does not cover more than 15 cm. This implies the use of several optics with an overlap of 5 mm on each side between one module and the following one. The useful width of one optics becomes 140 mm. Ten optics are therefore needed to cover the required width.

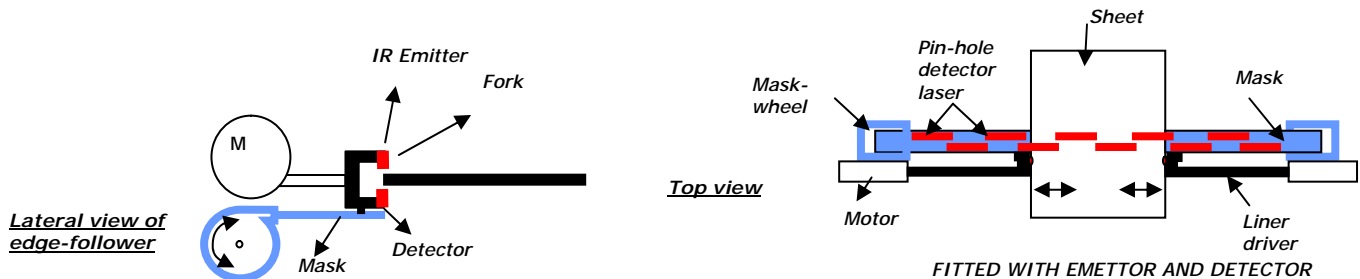
The following drawing represents the arrangement of the 10 modules seen from the top, as well as the existing overlap between every device. Total width of detection is 1455 mm



Sheet is inspected in its quasi totality thanks to fast slaved edge-followers : less than 3 mm of loss and a high speed control.

Edge-follower is a mask mounted on a mobile device slaved to the edge of strip. It protects the photo-receivers from the laser beam for lasers situated outside the strip. It ensures three functions:

- Automatic adaptation of the system to any width of strip included between 700 mm and 1400 mm.
- Compensation of the axial movement of the strip.
- Masking of the defects of the strip on 1 to 3 mm (a hole at 3 mm of the edge is detected).



Each fork is fitted with an infrared detector (different than pin-hole detector's one). It detects permanently the position of sheet's edge. Rolling-mask is moved concurrently to lose only 3mm of metal. Its speed is 200 mm/sec.



CEPHEE on a Tin Free Steel line before the shearing tool

Nota : Non-contractual document - specifications may be subject to modification without prior warning / May 2009 / DCFA 021 10