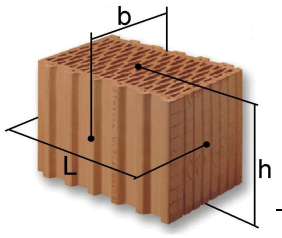
JLI vision
EYE FOR QUALITY

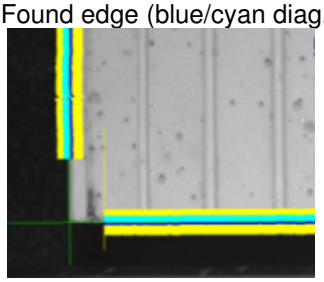
Proposal for Vision System for Hollow stones



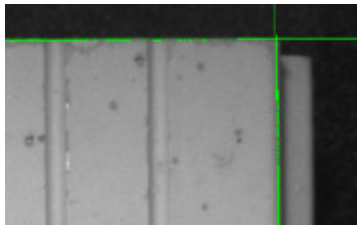
Principle: The Vision system will automatically detect a stone (object) when the stone enters the viewing angel of the cameras. Hereafter follows 4 viewing sequences.

1. sequence: A block/edge finder will find the edge of the stone.
   The yellow diagnostic shows area of interest (where the analysis takes place)
   The found edge is shown by the transition from the blue to the cyan diagnostic.
2. sequence: On basis of these points the best estimate of a straight line will be calculated (the green lines). Using these four lines the width, length and angle will be calculated.
3. sequence: The yellow points are the located edge on the stone
   The green line is best estimate of a straight line using only the first and last 20pixels on each side. Bow analysis is done by calculating the area between the yellow edge and the straight green line.
4. sequence: The pattern analysis verifies if the grid/pattern is complete and if thickness of shell is increasing. This analysis will be able to verify when a trend starts so that the WZI work will be able to intervene in due time.

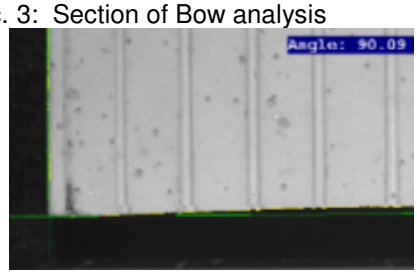
Pic. 1: Found edge (blue/cyan diag.)



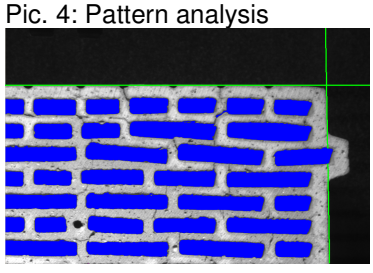
Pic. 2: Edge finder (straight green line)



Pic. 3: Section of Bow analysis



Pic. 4: Pattern analysis



The system also contain trend curves, automatic data logging and diagnostics such as number of stones, number of specific faults etc.

JLI vision a/s, Denmark

Resolution and accuracy:

Height, Length: Accuracy is calculated to 3 pixels pr. mm, which gives an accuracy of 1 mm

Bowing: Accuracy is calculated to approx 6 pixels pr. mm, which gives an accuracy of 2 mm for measuring width of bow (from best estimate (green line) to actual estimate (yellow line))

Rectangularity: Theoretically the system will measure down to 0.2 degree. On the basis of the roughness of the Bricks JLI guarantees an accuracy of 1 degree.

Pattern analysis: Accuracy is calculated to 2 pixels pr. mm, which gives accuracy less than 1mm

System description: The system consists of the following parts:

1 Industrial Vision Computer in a 19" industrial computer cabinet.
3 Industrial high resolution matrix cameras
Special filters and high definition lenses
3 Light units
Monitor, mouse and keyboard
Software: JLI developed SW incl. JLI System Manager Technology for program surveillance. Windows XP Embedded (high stability and security version)

Mechanic setup to be decided with end-customer. The system is fully automated and needs no interference from the production floor.

Guarantee: The proposed system is under one year guarantee from commissioning and defective parts will be repaired or exchanged free of charge in Copenhagen. JLI will under normal circumstances be able to service the system from Denmark using the ADSL line.
Functional Guarantee: JLI offers a 'no cure no pay' guarantee which in short means that should the system not be able to perform according to agreed standards and Functional Design Specification (FDS), the customer will only cover the transport and installation & commissioning.