

CASE STUDY



Fig 1. Complete Inspection Station

New industries utilise machine vision technology.

Furniture Manufacture

With the increasing rise in quality requirements within the automotive, pharmaceutical and electronics industries there is naturally going to be a knock-on effect for other manufacturing sectors. Flat pack furniture manufacture is notorious for having many quality problems including missing bags of screws, missing panels, wrong types of panels, missing instruction sheets etc. This is primarily due to the fact that many of the processes rely on hand built manufacture, because of the complexity and number of different types of furniture. Therefore it doesn't naturally lend itself to automated production.

One such company is Acre; they are one of the leading manufacturers of flat pack furniture and are leading the way in highly automated quality control as they believe quality and service to their customers is of the highest importance. Industrial Vision Systems Ltd has developed an automated inspection system for Acre which will check the components of the flat pack prior to sealing and final delivery of the product. Pre-requisites for the system included a rapid and configurable user interface, coupled with the ability to show real-time feedback to the operator for problem parts, and trends emerging from the manufacturing process.

The main problem was the large variety of parts they manufactured, and the infinite number of styles and types for various customers, therefore it was important that the system had the ability to store and retrieve pre-set inspection sequences.

Test Sequence

The packs to be inspected are driven along a continually moving conveyor. Operators stand to the side of the conveyor and carry out operations as the pack moves past their positions. Towards the end of the line is the vision system as shown in Fig 1.

As the parts enter the machine a sensor is ready to detect the position of the pack. Once the workpiece is centred in the machine the sensor is made and the PLC triggers the vision system for the inspection to take place in real time. The vision system is based on the industry standard NeuroCheck software in conjunction with NeuroCheck FWXC13c Firewire cameras which offer huge benefits to Acre for this sort of inspection. With the NeuroCheck Firewire technology individual camera set-ups can be allocated and changed in real time depending on the pack requiring inspection and the particular light requirements for that pack.

Two high resolution Firewire cameras are used with colour sensors offering the ability in NeuroCheck to perform a number of differing image processing techniques including colour matching, template matching and neural network classification in key areas of the furniture. The pack does not have to arrive parallel to the track as through NeuroCheck automatic position adjustment is performed.

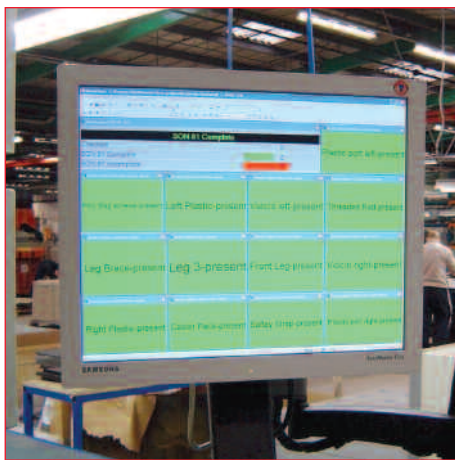
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The inspection takes place in real time whilst the pack continues to move along the conveyor. Upon a failure the line is stopped automatically via the PLC, plus the nature of the error is shown through the NeuroCheck software screen, and finally an audible siren alerts an operator to correct the pack.

An important part of the whole system is the reliable and exact nature of the lighting and optics used – giving repeatable and dependable results. For the system two high frequency machine vision fluorescent lights are used in conjunction with polarising filters. The optics for the system were 50mm manual iris, fixed focus lockable lenses.

Software Solution

As discussed previously there were a number of requirements to be met within the system, hence a flexible machine vision software solution was required to check for errors such as missing screw, panels and instruction leaflets etc. NeuroCheck has the ability to sub-divide the inspection criteria into discrete steps (called "Individual Checks") which make up a "Check Routine". It was important to methodically build up the database of good and bad parts by constant testing through the unique development architecture which NeuroCheck offers, i.e. the ability to test results on the same system that will later be used in production.



Software Screen showing Results.

The unique ability to offer flexible inspection criteria, in tandem with the ability to save data to Excel in real time, gives the system ultimate power for detailed analysis of the failures. The software will collate statistical information for the individual errors, as well as saving individual images of the failed parts to give a visual database of any errors occurring.

The total solution gives unparalleled results in the quality inspection of flat pack furniture offering a never before achieved level of defect detection. The system is characterised by simple, clear operation and a high degree of reliability. Changes to parameters are password-protected on the shop floor and the system is networked via an ethernet connection to the machine. Therefore any new parts added to the system can be set-up via engineers from the comfort of their desks.

In conclusion the NeuroCheck system provides a clear method for automated visual inspection and continues to be the system of choice for manufacturers requiring 100% quality control across many new and diverse industries.

www.industrialvision.co.uk



IVS (UK and Ireland)

Kingston Business Park • Kingston Bagpuize
Oxfordshire • OX13 5FE • UK
Tel :: +44 (0) 1865 823322
Fax :: +44 (0) 1865 823393
E-mail :: sales@industrialvision.co.uk

NeuroCheck GmbH (Germany)

NeuroCheck GmbH • Neckarstr. 76/1
D-71686 Remseck • Germany
Tel :: +49 (0) 7146-8956-0
Fax :: +49 (0) 7146-8956-29
E-mail :: info@neurocheck.com

Worldwide Distributors:

Austria +49 7146 89 56 0
Ireland +44 1235 227295
Malaysia +65 6272 2766
Spain +34 91 692 21 17

France +33 4 50392466
Israel +972 9 76767654
Portugal +34 91 692 21 17
Thailand +65 6272 2766

Indonesia +65 6272 2766
Italy +39 0444 96 21 28
Singapore +65 6272 2766
USA +1 630 932 9380