DATE: 29 September 2004

AUTOMATED AND CONSISTENT INSPECTION STANDARDS WITH OFF THE SHELF TECHNOLOGY REDUCE WASTE

Many industries now benefit from automated computer based inspection or 'machine vision' as it is known. These systems can operate in harsh environments, continuously performing a broad range of tedious inspection tasks, with repeatability far and above that of a human operative.

Shelton Vision Systems, in collaboration with Loughborough University, have researched and developed a number of PC based machine vision systems. These systems provide customers with dedicated inspection platforms using off the shelf, PC technology. Harsh environments have proved to be no barrier with equipment installed alongside fibreglass curing ovens, laminating lines, lithographic plate facilities and in textile manufacturing facilities.

The Shelton WebSPECTOR® family of machine vision products can tackle a wide range of inspection tasks that until now have required bespoke engineering.

The WebSPECTOR® range breaks inspection tasks or requirements into three groupings:

1. Tasks such as gauging, location and measurement where the objects being studied have a pattern or profile to match against are covered by the WebSPECTOR® Lite system.
2. Fault detection tasks involving unknown data are covered by the WebSPECTOR® Standard system.
3. Tasks requiring increased functionality such as data base management, defect libraries and self training are included in the webSPECTOR® Plus system.

Each of the above systems form the basis for a custom engineered solution, which is scaled to suit the mechanical size and resolution of the task being undertaken.

Utilising stage-of-the-art technology the systems offer consistency of inspection 100% of the time. All the systems can be employed, on line, in uninhabitable areas preventing further work or investment in faulty product, which would result in wasted production and higher costs. Alternatively, sited at the end of the production line they lead to increased customer confidence by reducing bad or varied product reaching the customer site and the costs associated this.

The fibreglass curing ovens at Owens Corning

The fibreglass curing ovens at Owens Corning Veil in Liversedge generate very high temperatures raising the ambient temperature in the immediate vicinity to over 50^{O}C. This is certainly no place, in which a human inspector could perform reliably and consistently for anything other than the briefest of periods.

The fibreglass is batched and moved away from the production line for detailed inspection. The high output of this type of process (over 150 meters per minute) means either several inspectors must be used or a single inspector inspecting a sample of each production run. This, combined with varying concentration levels of an individual inspector, leads to variations in the inspected quality of the output product.

Owens Corning's use of a machine vision system has lead to consistent levels of inspection across the full width of the product at the point of manufacture for 100% of each production run. By feeding back inspection results at the point of manufacture the system has also lead to a significant cut down on waste as production alterations can be made in real time.

"The WebSPECTOR® system gives us early warning of production problems, which we can rectify before wasting considerable amounts of raw materials. In particular, the recently introduced classification of faults helps us to analyse the

line conditions over time, which drives down waste even further.” said Owens Corning’s Subir Chandra.

As an indication of the punishment which a suitably protected PC based system can withstand consider the task of inspecting remoulded tyres. In this operation repaired tyres are inflated to a pressure of 10 bar before being inspected for bulges and distortions. The inspection consists of rotating the tyre which is being scanned by a laser and using a camera to obtain a series of images which allow the tyres profile to be measured to 0.2mm. Equipment within the test booth must be able to withstand the pieces of high velocity rubber which are produced in the event of a tyre exploding during the high pressure test.

Similar benefits have been proven with inspection systems mounted on looms in weaving facilities. By inspecting the fabric being produced, the machine vision system can alert the operator to problems as they occur or automatically stop the machine. This reduces the levels of scrap produced and increases customer confidence due to the receipt of a higher overall quality product.

W.L. Gore and Associates increase quality

W.L. Gore and Associates use the Shelton system to inspect high quality PTFE laminate products as they come off the production line. Any faults are tagged automatically thus enabling inspectors to move quickly from tag to tag without

spending time looking at perfect material. At each tag, the inspectors assess the significance of each fault and carry out any cutting or mending operations.

Stuart speake, of W. L. Gore, said “The software is user-friendly and the fault tracking and statistics generator are useful because they enable us to control quality very tightly. The error mapping allows us to look at and analyse exactly what is happening in our production process. It takes out the subjectivity and de-skills the process”

PC technology has powered the vision revolution

PC technology has now become so powerful that it rivals processing technology once considered ‘specialist’ in terms of the performance that it can achieve. This has resulted in cost efficient solutions for computer based inspection tasks, which were once only given consideration in the simulated environments of academia.

The new applications, which are now becoming viable, are doing so because of the giant leap forward in PC performance, which has seen a quadrupling in clock speed in the last five years. Algorithms, which could only be run as simulations in the lab, can now be run in real time. Linking the PCs together and sharing the load means that gigabytes of image data can be processed per second where only megabytes were achievable previously, although the actual data rate processed will depend on the complexity of the processing methods employed.

The state of the art PC based inspection system can provide practical information for the update of manufacturing processes running at production speeds.

Cameras are used to view an image of a scene containing a component or surface to be inspected. The image is acquired and transferred to the computer where it is analysed by software. The action of the software will depend on the task assigned to the system from relatively simple outline gauging of two-dimensional objects through to surface fault detection looking for faults a few microns wide. An important consideration is the subject illumination. Correct lighting can massively simplify a task, which at first glance seems complex.

The load, which a particular task will place on the processors, is determined by two things - the raw image data rate and the complexity of processing. The data rate is defined by the width of the object being viewed, the resolution at which it is being examined and the speed at which it is travelling (or frequency at which things appear if looking at individual items). A narrow width high-resolution task may place as high a load on the system as a wide width object under low resolution.

Speed need not be an issue. The modularity of PC based systems allows several PCs to be networked together allowing small sections of the inspection task to be handled locally and the results combined in a method which takes advantage of

distributed processing. Key aspects of the application are object speed, width and fault size.

For further information please call Mark Shelton on 0116 275 3421 or email mark@sheltonmachines.co.uk

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