

Achieving closer inspection of cylindrical surfaces

A new industrial vision system, **trevista Cylinder**, from **Stemmer Imaging** allows automated inspection of milled, polished and galvanised cylindrical components for otherwise difficult-to-spot defects such as scratches, dents, discolouration and stress marks.

Using a patented inspection process, **trevista Cylinder** goes beyond the limits of conventional vision systems to provide reliable inspection of a range of surfaces from glossy components to diffusely scattering surfaces and even black plastic.

Supplied as a complete system with structured diffuse illumination, lens, camera, software and PC, **trevista Cylinder**, is based on a patented technology called 'shape from shading' that allows information on the three-dimensional shape of an object to be deduced from the shading of its surfaces.

The cylindrical objects are rotated along their longitudinal axis under the special dome-shaped diffuser.

During the rotation the line scan camera scans the object and the profile data obtained are planar images of the uncoiled material surface - synthetic images containing topographic information.

Applying a special algorithm allows inspection for characteristics such as scratches, dents, discolouration and stress marks according to their inclination, curvature and texture.

The topographic images allow the display of three-dimensional surface shape, revealing defects down to just a few micrometres depth. These defects can be located quickly, reliably and free from interference, and

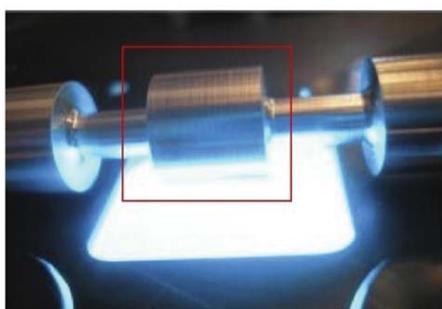
can be readily distinguished from irrelevant stains such as those caused by lubricants, for example.

Optimised light source

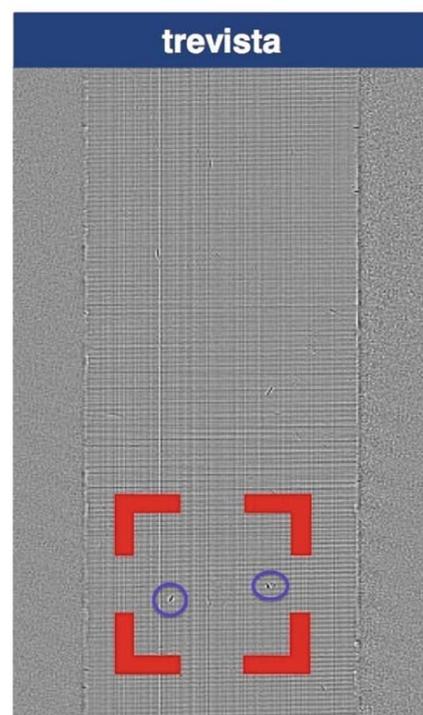
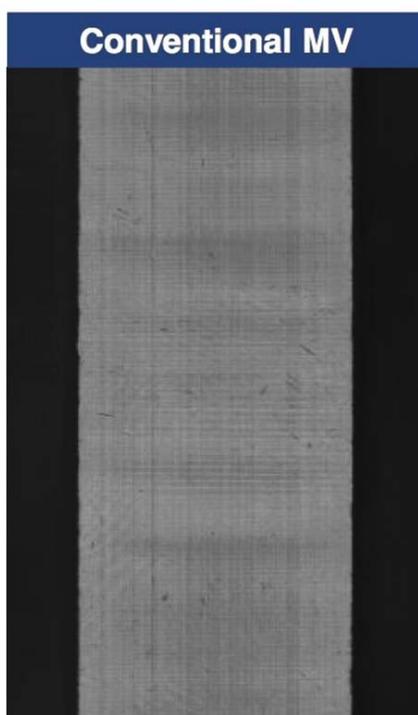
One of the most commonly used inspection light sources is the bar light. However, for shiny surfaces this gives direct reflections and no difference can be seen between surface texture and topology. The use of dome illumination reveals texture, but topology features have poor contrast.

Coaxial illumination shows no difference between texture and topology and is very sensitive to tilting. The **trevista** system, however, makes use of a domed structured diffuse illumination source in combination with the 'shape from shading' technology to overcome these problems.

The dome-shaped illumination ensures optimum and even illumination



A **trevista** image taken of a cylindrical surface. Two small defects in the red rectangular area can be seen that are difficult to identify in the conventional image



Feature: Optical Inspection Technology

from different directions and also suppresses interfering ambient light. The illumination housings are available in three different sizes to allow components up to 200mm diameter to be measured. The structured diffuse illumination guarantees high-quality images for subsequent automatic evaluation.

Processing the image data

Key to the performance of the system is the way image data is processed. 'Shape from shading' technology is an approach to obtain the shape of an object from a series of four sequential images obtained at different angles of illumination.

A special algorithm is based on the image gradient for fusion of image data. The process filters the image information produced to separate topography and texture into different images.

The so-called texture image that is created allows brightness on the object to be shown. The calculation algorithm is computer-based and images are acquired using Stemmer Imaging's imaging toolkit, Common Vision Blox.

Input image data for further analysis is then transferred into the Sherlock software platform from Teledyne DALSA where it is pre-processed and provided in the form of result images (slope images, curvature image, texture image), for subsequent analysis by the user.

Sherlock also provides the user with a variety of standard vision tools – a 'blob' analysis, for example – in order to process the images and conduct the inspection task with maximum efficiency.

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