

Focus and tracking errors present a major challenge to manufacturers of high-speed recordable DVD formats. Dr Leonhard Schwab (CTO, dr.schwab Inspection Technology GmbH) offers an in-line inspection solution which strikes at the root of the problem.

Focus errors (FE) and tracking errors (TE) occur when the pick-up head is unable to respond to changes in the disc surface sufficiently quickly to maintain focus on the data layer and position on the groove. The potential for FE and TE increases with write speed: while the pick-up head may have no problem with an unevenness at 8X, the same defect at 16X means that the head must accelerate four times more quickly to stay in focus.

High-speed DVD recordables are therefore extremely sensitive to these so-called acceleration defects. Tighter tolerances must be applied, and the manufacturing process carefully controlled to maximise yield, especially in today's competitive climate. It's better to avoid defects than attempt to correct them, and our IQPC in-line scanner provides all the tools required to identify acceleration defects and help tune the process.

Two contributions to acceleration defects must be taken into account: local non-uniformities in the disc surface, and long-wave deformation of the substrate, or 'global' acceleration.

IQPC sets the pace

Localised surface deformities - such as hard-coating unevenness, bumps, and bonding bubbles - neither absorb nor scatter light and

cannot be detected by a standard bright-field channel. IQPC comes complete with a near dark-field arrangement which detects these low-contrast defects to the pixel resolution of the camera, and was the first scanner to offer this level of accuracy as standard. Figure 1 gives examples of typical local acceleration defects detected by IQPC.

IQPC is equipped with individual processors for different tasks so that it can perform multiple measurement and data-processing operations in parallel; this exceptionally high processing capability, coupled with sophisticated image analysis, enables it to evaluate the entire area around a defect, analyse all its properties, and give a definitive classification.

Global acceleration is evaluated by the tilt unit. An 8-radius measurement covers the complete surface and measures acceleration defects down to a millimetre scale. By combining the 8-radius tilt measurement with the highly-sensitive near dark-field channel, IQPC detects all acceleration defects, from small to large scale (Figure 2).

IQPC also monitors another source of tracking errors: eccentricity. This parameter is especially critical following a stamper change. Because IQPC inspects the inner disc area by camera - rather than by sensor - it can offer a unique in-line eccentricity check.

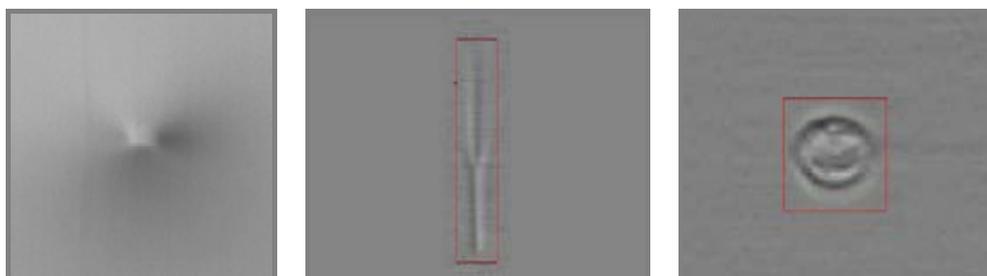


Figure 1: Examples of acceleration defects – bump; hard coating unevenness; microbubble

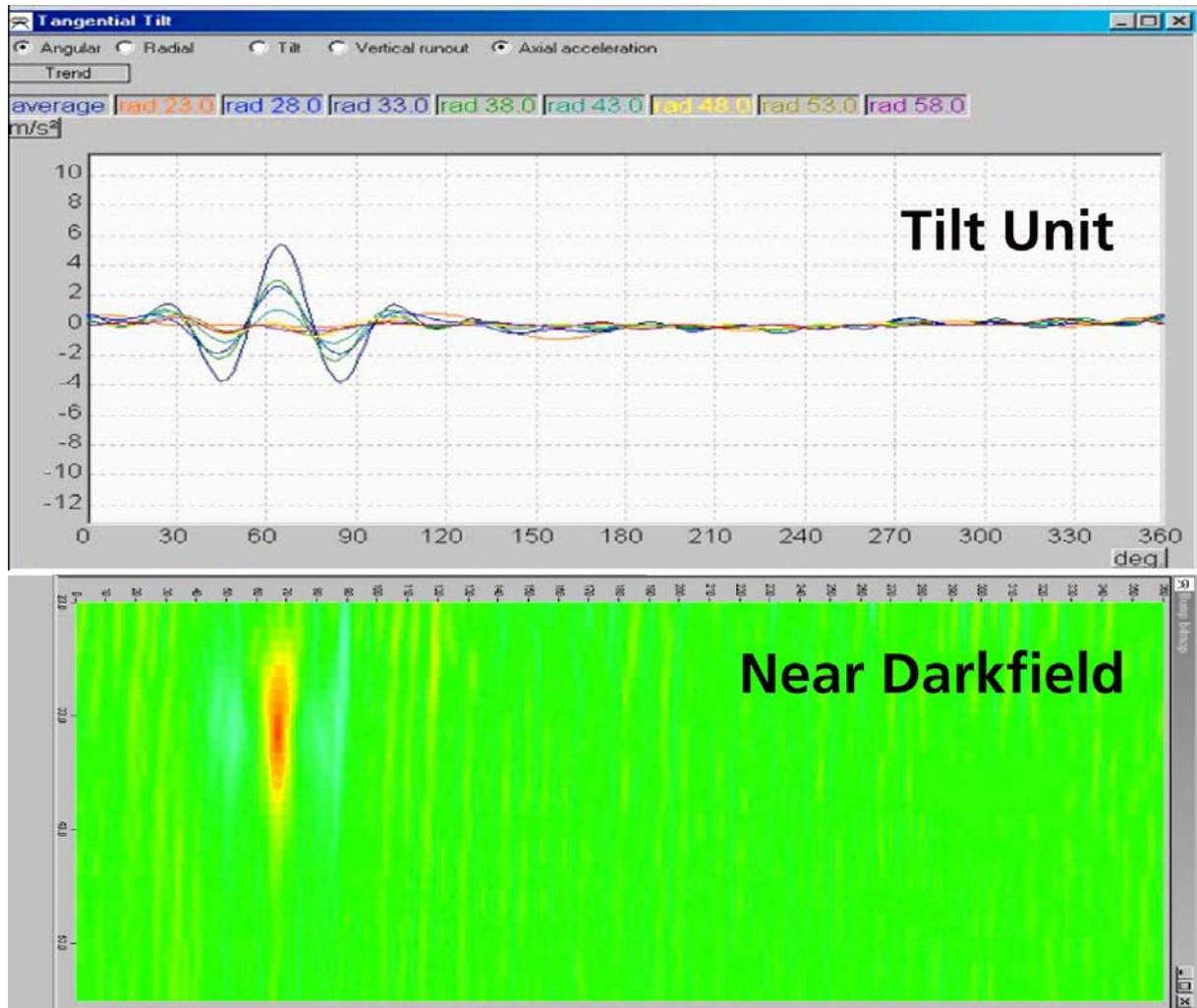


Figure 2: High-resolution tilt measurement and near darkfield channel for 100% detection of acceleration defects

Pre-emptive action maintains quality

IQPC's exceptional data-processing capacity means that it can handle the exacting measurement, evaluation and analysis requirements for 16X DVDR without compromising cycle time. The Windows XP® software is smart but user-friendly: customisable display options include a high-

resolution 'top view', zoomable graphs and grey-scale defect images. Clear presentation of results and sophisticated trend analysis give real-time feedback to identify the root cause of TE and FE issues, providing the opportunity for cost-saving pre-emptive action before product quality runs out of control.