



Pressings subcontractor replaces two CMMs with one Nikon video measuring machine

Optical inspection time halved and touch probing cycles cut 15-fold

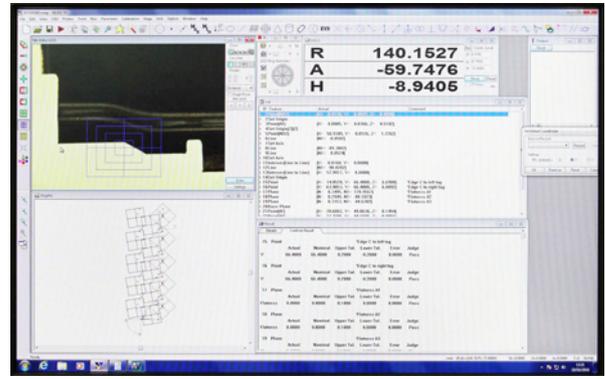
Second-tier supplier of light pressings and small assemblies to the automotive industry, Berck Limited, has invested in a Nikon Metrology iNEXIV VMA-4540 CNC video measuring machine fitted with tactile probing capability. Installed at the subcontractor's factory in West Bromwich, UK, the multi-sensor machine has greatly speeded the inspection of 2D and 3D sheet metal components, improved measuring accuracy, and facilitated the production of detailed quality reports for customers. It also allows manufacturing processes to be optimised by providing detailed historical measurement data to be compared with current inspection results.

Two-thirds of Berck's output goes to the vehicle manufacturing industry in the UK and overseas, of which 40 per cent is bracketry for the engine compartment or wiring loom and the remainder comprises precision contacts for lights, windows, seats and other electrical equipment. The other third of production is delivered to customers manufacturing domestic electrical goods such as cookers, lighting and plugs. Components are stamped using up to 12-stage progression tools on 23 presses, including 12 high-speed models, mainly from coil between 10 and 150 mm wide, 0.1 to 3.5 mm thick. Materials encompass brass including tin-plated varieties, mild and spring steel, copper, beryllium copper, phosphor bronze and aluminium.

The subcontractor has for many years used a Mitutoyo Quick Vision Ace CNC optical coordinate measuring machine (CMM) and a Kemco manual touch-probe CMM to inspect sheet metal parts and tools. The former machine is nearing the end of its useful life, while the latter was recently dismantled as it was beyond economical repair. Last year (2015), realising that a new metrology solution would soon be required, Berck's quality manager Steve Bettridge visited the Advanced Manufacturing Show at the National Exhibition Centre, Birmingham, to investigate what alternatives were available.



■ Steve Bettridge, quality manager of Berck Ltd, with the Nikon Metrology iNEXIV VMA-4540 multi-sensor CNC inspection machine, which includes video measuring and tactile probing capabilities.



■ NEXIV software displays multiple windows, including of the component feature currently being measured (top left), areas of the sheet metal component being checked for flatness - in this case to 0.1 mm TIR (bottom left), plus current coordinate position, the program being run and the inspection results.

He was keen to combine the functions of both the Mitutoyo and Kemco CMMs in one machine and was also aware that 95 per cent of throughput in the quality department at West Bromwich is optical measurement of sheet metal components. Only 5 per cent is touch probing for inspection of components with steep sides, like fuse cups that have a dimensional tolerance of $\pm 20 \mu\text{m}$ and are difficult to inspect by optical auto focus. Parts with complex external profiles such as radiator cap inserts are similarly difficult to measure optically. Tactile probing is also employed to assist the in-house toolroom by reverse-engineering inserted press tools, for which no drawings exist, to allow their re-manufacture.

After discarding the idea of combined touch probing and laser scanning on a CMM, as that level of accuracy was not needed for pressed parts and the cost was too high, Mr Bettridge looked at various alternative video measuring machines and decided in favour of the Nikon Metrology iNEXIV. The machine had a larger stage than others on offer, so promised greater versatility use, the company's proprietary software was considered easy to use, and the quality of the Nikon camera and objective lens was beyond question. It is noteworthy that, although laser technology has not been adopted, there is the option to fit laser autofocus if the need arises.

The Nikon CNC video measuring machine is equipped with three light sources for efficient inspection, whatever the type of product. Episcopic (overhead), diasopic (transmitted light) and an 8-segment ring LED combine to provide comprehensive illumination and accurate edge detection.

Multi-part measurement speeds optical inspection

Since it was installed in April 2016, the iNEXIV has been a resounding success. Optical measuring routines are programmed conversationally in half the time required using G-code for the Quick Vision Ace. The

stage on the Nikon instrument, with its 450 mm x 400 mm working area, is four times the size and the axis movements are considerably faster, so more components can be inspected in a shorter time.

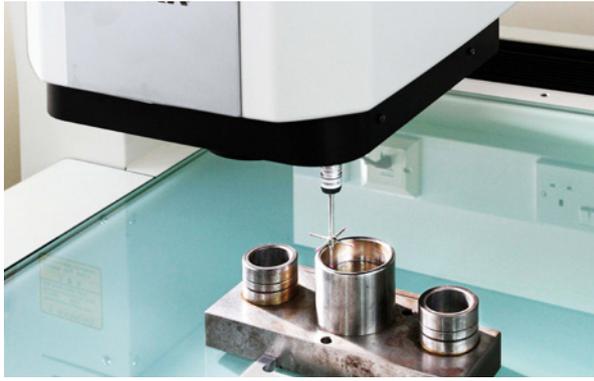
Comparing like with like, the high-speed iNEXIV with its wide field of view and search capability, allowing automatic component recognition and alignment, enables a given number of components to be measured 50 per cent faster than on the Mitutoyo. Moreover, the parts do not have to be all the same; they can be families of different items arranged in a grid. Provided that the Nikon machine is programmed to inspect the series of components, it measures them all seamlessly and automatically while the operator is deployed elsewhere.

Another advantage of the new inspection facility is its ability to measure folded 3D sheet metal components optically using the instrument's 200 mm Z-axis stroke, 73.5mm vertical working distance and auto focus capability. The limitation of the other instrument is that its Z-axis is not sufficiently accurate to produce reliable results, so it is necessary to transfer components to an optical projector to determine their depth. Double handling in this way results in a measuring process that is more than twice as long.

Efficient touch-probing of steep-sided components

For tactile inspection, the advantages of the CNC iNEXIV over the previous manual touch-probe CMM are even more profound. For a start, the Nikon machine undergoes one 5-minute calibration cycle per week covering the use of all probes. Idle time was considerably longer using the Kemco CMM, as it needed to be calibrated once per day for each probe used.

Formerly, components had to be aligned by hand before each inspection routine could start. On the Nikon machine, the position of the component is identified automatically to enable the part to be



■ Inspection of one of Berck's single-impession press tools using a star stylus in the Renishaw TP20 probe, which is offset from the optical axis but operates in the same XYZ coordinate system.

measured with minimal delay. If a changeover between the 2.5 mm ball probe and a star probe is required during the cycle, it is achieved automatically via a Renishaw rack.

Consider, for instance, inspection of 10 of the aforementioned fuse cups. According to Mr Bettridge, it used to take half an hour to complete the job manually, with the attendant risk of damaging the stylus due to human error. Now the process takes a couple of minutes – a 15-fold time reduction – provided that the cycle is already programmed and stored. For such a simple component, it would only take five minutes to program anyway.

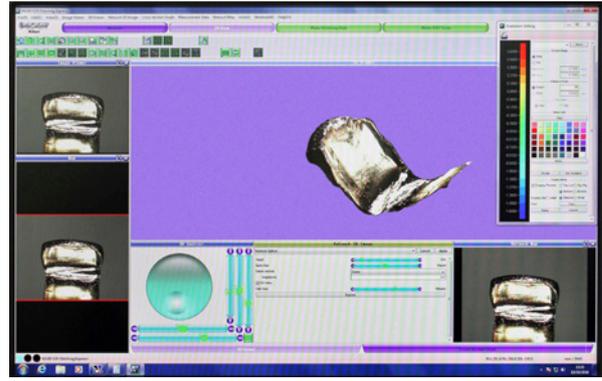
Advanced analysis and reporting software

With Nikon Metrology's AutoMeasure software, it is easy to create programs and automatically compare results against CAD models. Deviation of contours can be checked by overlaying digital charts from 2D CAD data onto video images.

The Nikon full-frame colour camera captures highly detailed pictures that are saved to the server at West Bromwich to provide a reference for future process analyses and troubleshooting. They may also be embedded in customer inspection reports produced by the software. Files of accompanying statistical data are downloaded automatically to an Excel spreadsheet, saving time compared with the previous manual procedure. Many other standardised reporting formats are possible.

Mitutoyo optical programs are currently being edited to run on the Nikon video CMM and about 200 have already been completed. In addition, 50 new programs have been created for the iNEXIV, both for optical and tactile inspection.

Berck uses another Nikon software package, called iNEXIV EDF (Extended Depth of Focus), that allows all-in-focus 3D images of products to be created by stitching together multiple pictures taken



■ iNEXIV EDF software allows 3D images of products to be created by stitching together multiple pictures taken at different Z-axis heights. Measurements can then be taken for investigation, problem-solving and archiving.

at different Z-axis heights. Measurements can then be taken from the resulting composite facsimile for investigation, problem-solving and archiving.

Mr Bettridge concluded, "Nikon engineers came here to provide training within one week of the video CMM being installed. It allowed us to learn how to program the machine and measure our own components, so the training was directly relevant to our business.

"The software is surprisingly easy to pick up, provided that you have a basic knowledge of the principles of metrology. It is also reassuring that Nikon offers software updates for a minimum of 15 years, so our new inspection facility is future-proof."

About Berck Limited

Established in 1947, family-owned Berck has gained an enviable global reputation. Chairman Brian Yates has dedicated over 35 years of his working life to the company.

With more than 50 per cent of production exported, the precision stampings company supplies products to China, Mexico, India, Brazil, Egypt, the United States, the Dominican Republic and most countries in western and eastern Europe.

Innovative design expertise, coupled with years of hands-on experience and a willingness to deliver innovative solutions, has placed Berck's components in nearly every car manufacturing operation in the UK and overseas. Recent years have seen rapid growth in other markets, such as the aerospace, IT, electronics, communications and medical sectors.