

A Solution to the Quality Control Process for Electron Beam Welding.

Ravenscourt Engineering Limited are using Vision ArchiVE, the new image archiving & analysis software from Vision Engineering Limited, to measure, analyse and catalogue joins that have been welded using the electron beam welding process. Imagery of the joins is captured using a stereo microscope and digital camera before analysing and documenting the imagery using Vision ArchiVE.



Ravenscourt Engineering Limited is a well established and respected engineering company specialising in electron beam welding. With the speed and accuracy of the process, electron beam welding is an increasingly preferred choice of welding technique, especially by manufacturers of precision machined component parts for aerospace, specialised automotive and pharmaceutical industries.

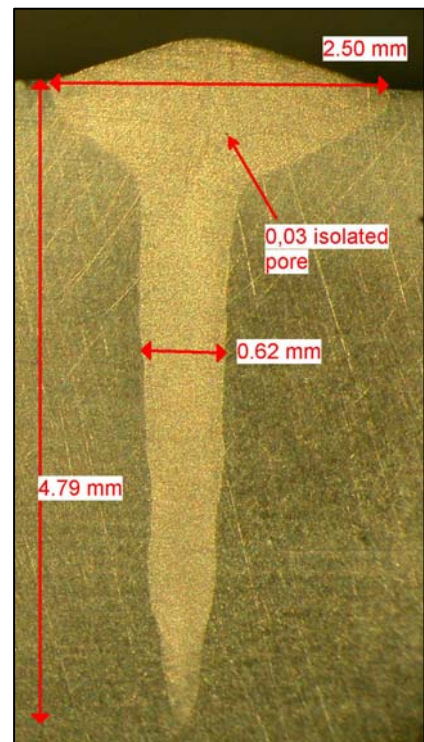
Meeting client's requirements for these specialised industries leans heavily on precision and quick turnaround times. Needless to say, with several accreditations in place such as management system ISO 9002 and FAA (Federal Aviation Administration) -FAR145, the traceability and therefore documented inspection and measurement are critical. Utilising the Alpha stereo microscope from Vision Engineering to inspect the welded joins and Vision ArchiVE software to measure, analyse and archive the outcome, Ravenscourt Engineering can continuously perform effectively to aerospace standards. Martin Burridge, Senior Engineer at Ravenscourt Engineering Limited explains...

"The Alpha stereo microscope from Vision Engineering provides us with an exemplary stereo image, brilliant contrast and superb clarity required for the inspection and measurement process. Coordinated with the use of a digital camera and the Vision's archiving and analysis software, enables us to digitise our findings, measure, analyse and generate a report for our quality control process. With the increase in orders and new projects, we need to be able to produce a comprehensive documenting system, providing us with a parameter to enforce a consistently high standard."

Electron beam welding is a process joining two components by merging them with a stream of high velocity electrons accelerating at more than 100,000 miles per second. This method of welding produces power intensities 5,000 times greater than conventional welding because the beam is concentrated to a precise area of 0.2mm in diameter. Repeatability is high with this welding technique with maximum control governed by a filament current that controls the rate of electron emissions, and accelerating voltage which regulates the kinetic energy of the electrons. The compound used to weld the two components is usually a remelt of the component material itself. Ravenscourt Engineering has numerous electron beam welding machines varying in power and can accommodate components weighing in excess of half a tonne.

The primary components that requires electron beam welding from Ravenscourt Engineering are for the aerospace industry and include the electron beam welding of butt, corner, lap & edge joints and 'T' sections. This welding technique provides the engineer with the capabilities of welding otherwise inaccessible locations, although easier locations minimise the process time and therefore increase productivity. Benefits of the electron beam welding process include: precise control over penetration and dimensions; high level of repeatability; freedom from impurities; negligible distortion and shrinkage. Although this welding process may initially seem an advanced and unnecessarily costly alternative to conventional welding, the numerous benefits and the saving on additional operations for example, stress relieving, reduces the overall cost of producing the product. With process times reduced to a minimum, when applying the electron beam welding technique, Ravenscourt Engineering found the service increasingly favourable with clients and prospective clients.

An example is where Ravenscourt Engineering applied the welding process to engine components for helicopters. The tolerance band for depth of penetration is very tight and can cause variations between batches because of the procedure of melting the component material to fuse the elements. The coupon samples are split and then examined, measured and documented maximising the continuous quality and accuracy of the weld. Ravenscourt Engineering utilise both the Alpha stereo microscope and Vision ArchiVE software from Vision Engineering to inspect and measure coupon samples from the batches. The high resolution and clarity of the image allows for the inspection and measurement procedure to be quick and easy. With a combination of experience, technology and expertise, Ravenscourt Engineering is providing a proven fast and affective service. In turn this has encouraged clients to commission an increasing amount of their projects to this professional expanding company.



Accurate inspection and measurement using Vision's Alpha stereo system and Vision ArchiVE software are generated at the beginning of a project as a benchmark. Vision Engineering's Alpha provides an excellent stereo image with superior clarity and contrast for the inspection for defects including cracks, lack of fusion and the inspection of the porosity of the weld. The image is then digitised using a digital camera allowing the quality engineer to measure the depth of penetration using the software. Components can be penetrated from a very shallow depth, to a single path providing a depth of up to 75mm. Vision ArchiVE allows for the panoramic assembly of digitised images and focus enhancements accommodating most lengths of penetration.

Originally Ravenscourt Engineering was using a conventional microscope. Although this method of inspection delivered an optical image of the weld, there was no facility enabling accurate measurement. Martin Burrige explains...

"The original method of inspection was through a traditional microscope providing illumination by a substage lamp. However, the Alpha stereo microscope from Vision Engineering provides superb clarity and contrast with both surface and substage illumination to inspect the welds effectively. With the new software package from Vision Engineering, the weld can be inspected and measured quickly and easily, identifying whether the test weld satisfies the client's minimum and maximum depth specifications."

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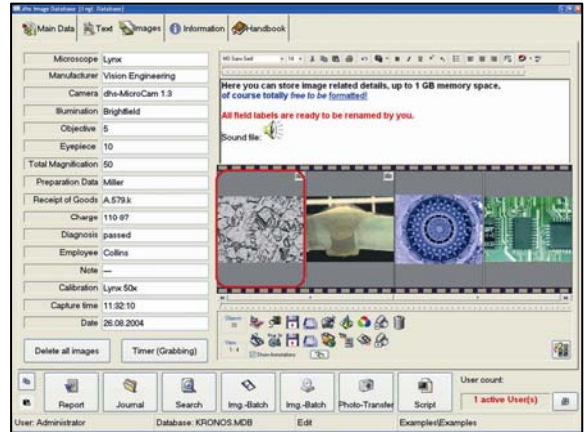
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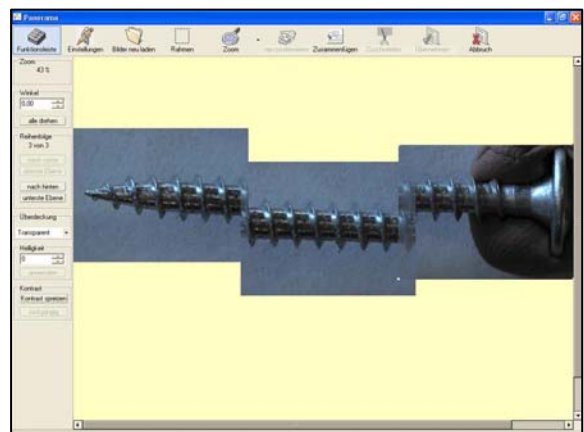
Vision ArchiVE provides the capabilities to measure angles and circles including radius, diameter, circumference and area. Scaling bars can be customised with various scales including imperial or metric. With a large proportion of oil and industries in the Unites States, Ravenscourt Engineering utilise the measurement feature by providing clients with a graticule and measurement of the penetration of the weld in both imperial and metric.

Integrated with Vision ArchiVE, inspection and measurement can be executed quickly and easily. The modular software will accept inputs from most analogue and digital cameras via framegrabber, twain, matrox RGB and direct import from camera or via photo transfer media.

With such a vast range of components being welded and therefore requiring inspection and measurement, the panoramic assembly feature allows for precise assembly of numerous captured images that would otherwise be outside the field of view. Additional available modules include sharpness reconstruction, image manipulation, metal sections, 3D representation, coating thickness and much more.



Ravenscourt Engineering is expanding their proficient Electron Beam Welding process to incorporate a comprehensive service from purchasing materials and machining through to the Electron Beam Welding with the aim of streamlining the supply chain. With a reputation for a quality service with quick turnaround times, providing an extended full service will give Ravenscourt Engineering the scope to accommodate a wide range of projects from start to finish. Continuing to provide fast, effective and accurate solutions to several key industries is mandatory for Ravenscourt Engineering. With tight quality control processes in place, Vision Engineering's Alpha stereo microscope and Vision ArchiVE analysis software will continue to support the fundamental quality control process.



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