Keep a close eye on corrosion

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Whether it is the fuselage skin of an aircraft or corrosion pitting on industrial couplings, it is critical to evaluate the severity of mechanical damage to stress-bearing parts. Surface defects represent stress concentrations, which are more susceptible to failure than the other areas of the component.

Very specific maximum allowances often apply to surface defects, which are essential to determine whether or not a part should be kept in service. To repair or replace parts can have significant structural and financial impact. Careful visual inspection should, therefore, be standard protocol for any force-absorbing component that exhibits scratches, blemishes or corrosion pits.

If a component is scratched too deeply, time and money are saved by making quick and sure decisions, and even more money is saved by not scrapping parts that are well within tolerance. It is to everyone's advantage when the guesswork is removed from decisions regarding aircraft component integrity. The portable optical micrometer has long been the tool of choice to measure the depth of these defects, from the surface to the bottom of the depression, thereby determining the severity of mechanical damage

There have been major product improvements and upgrades with portable micrometers over the years, but none that compare to the completely new and innovative designs of the latest models.

“Portable optical micrometers needed to bring a higher level of precision and integrity to this important judgment process,” says John Chadwick, President of the J.Chadwick Company. “Should a defected part be repaired or replaced? An instrument that is giving inaccurate readings could cost a company many thousands of dollars in unnecessary new parts when the defective ones were still within compliance.”

“Chadwick brought us in to take the hand-help optical micrometer to the next level, to make an electronic rather than a manual device,” says Alex Biegel, Mechanical Engineer with Lincoln Laser. “We designed the electro-optics, software and graphics for the unit. The engineering certainly had its challenges — designing the unit to have a scratch depth measuring capability to 20,000ths of an inch and operating at the one-micron level.”

Optical micrometers are portable microscopes specifically designed for measuring depth. They are used for measuring three-dimensional relief along the z-axis within any x-y field of view, and they accomplish this by measuring the difference in depth between any two focal planes. The instrument is focused on a region of interest and set to zero. Then as a second region is brought into focus, depth is shown on a digital display.

As an inspection tool, optical micrometers provide quick, accurate and repeatable results where other methods are time-consuming and inconclusive. Scratches, gouges and corrosion pits are easily measured where the fingernail-test is often the only alternate method in use. The tools are particularly good for measuring the depth of corrosion pits, as built-in magnification makes it easy to find the deepest part within a given area. Hours of blend-out labor can be avoided when it is determined ahead of time that a corrosion pit is too deep.

Whatever tech improvements are on the horizon for portable optical micrometers, it is clear that the instrument has just recently taken a quantum leap forward in accuracy and user flexibility.

— Jim McMahon