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NON-DESTRUCTIVE TESTING OF LASER WELDS ON PLASTIC

Task

In many industrial sectors, laser transmission welding of plastics has become established as a production process. Increasingly, the range of applications has expanded as the lightweight construction of components critical for safety is becoming more important. The processing of such components, however, increases the demands on quality assurance and component testing. The plastics typically used in industry, in particular fiber-reinforced plastics, are opaque or non-transparent in the visible wavelength range and also exhibit strong scattering. The component located in the interior of the laser welds cannot, therefore, be analyzed by microscopy methods, but often only via destructive methods. For this reason, the industry needs alternative non-destructive testing methods which make it possible to inspect the welds one-hundred percent so as to meet the more demanding testing requirements.

Method

Under a system comparison, several non-destructive testing methods on the market or in development were tested if they were able to detect defects in laser welding seams on plastic. For this purpose, test specimens were produced out of representative plastics, and laser welds with defined voids were introduced into the specimens. In addition to the

X-ray testing, ultrasonic, terahertz and ultrasound testing, the lock-in thermography in particular was examined. In this method, the test specimen is excited with laser radiation, and the heat conduction detected by means of thermography. The same test specimens were analyzed in the investigation with the different test methods to finally obtain a basis to compare their suitability.

Result

The test results are strongly dependent upon the individual plastics, their structure and additives. Defects, flaws as well as the welds can be detected and identified well depending on the procedure. The appropriate test procedure must, therefore, always be selected individually for the inspection task.

Applications

The results and the applied non-destructive testing are suitable for various applications in which defects or flaws – in addition to welds located in the interior of the part tested – must be detected in plastic components.

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1 Plastic sample with internal welds tested non-destructively.