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Laser ultrasonics has its own characteristics for the nondestructive evaluation (NDE) of materials, with its non-contact nature, broad bandwidth, adjustable spot size and simultaneous generation of modes. These features have an impact on the use of digital signal processing (DSP) methods for laser-ultrasonic applications. Examples of implementation of DSP methods to improve laser-ultrasonic performance for NDE are reviewed. First, a signal processing approach based on a single echo was developed for both thickness gauging and grain size measurements in steel. The approach was successfully implemented for on-line process control of seamless tubes in a production plant. A second example is the development of the Synthetic Aperture Focusing Technique in the Fourier domain (F-SAFT) to improve both defect detectability and lateral resolution of laser ultrasonics. The approach was found successful in the detection of inclusions in steel slabs, visualization of stress corrosion cracks, delaminations along curved interfaces and the integrity assessment of friction stir welds. Another example is residual stress measurement by precise determination of the small velocity variation of the laser generated surface skimming longitudinal wave. The method was used for residual stress evaluation following surface enhancement process like laser shock peening, as well as joining process like friction stir welding. A fourth example is the use of an optimization procedure for simultaneous determination of WC-Co coating thickness, elastic moduli and density. In this approach, the velocity dispersion curve of the surface acoustic wave is compared to a model and a numerical scheme is used to evaluate coating properties. A last example is about a resonance spectroscopy approach coupled to a two-layer model to determine the thickness of the paint layer and of the metal plate by numerical inversion. The method was used for the detection of hidden corrosion in lap joint structures with painted surfaces. Details on such examples using DSP for laser-ultrasonic NDE will be discussed.