Thermosonic (Sonic IR) Imaging is a new nondestructive testing (NDT) technique that uses high-frequency sonic excitation together with infrared (IR) detection to image surface and subsurface defects. This Sonic IR imaging technique uses a short (usually fraction of a second) pulse of high frequency (typically 20-40 kHz) sound which is applied at some convenient point on the surface of the object under inspection to produce localized frictional heating at the defect. An IR camera images the heating of the surface resulting from the effects of friction or other irreversible internal surface interactions in the vicinity of defects. These effects result from the fact that the two surfaces of internal defects do not move in unison when sound propagates in the object. Conventional thermosonic imaging system employs an ultrasonic welder, which is designed of a single frequency. This single frequency ultrasonic source has been found to yield "blind zone" for NDT due to the formation of a standing waves inside the test piece. To overcome this limitation, a spring loaded ultrasonic transducer was used to generate the desired multi-frequency acoustic chaos in the test object [1]. This simple design turns the preciseness of the frequency of ultrasonic horns into devices of a very broad discrete spectrum of sound into the object to which they are coupled. The limitation of the spring loaded ultrasonic transducer is its repeatability and reproducibility for field applications. In this work, we present a development of a novel thermosonic imaging system, which is capable of exciting the ultrasonic transducer at different frequencies for thermosonic NDT to overcome the limitations associated with single frequency power source as well as the spring loaded transducer design. A comparison of experimental results will be made between the single frequency and the developed multi-frequency thermosonic NDT systems.

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References: