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An Electromagnetic Acoustic Technique for Non-Invasive Defect Detection in Mechanical Prosthetic Heart Valves

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Abstract

An Electromagnetic Acoustic based Technique (EMAT) has been shown to be successful in detecting strut failures in mechanical prosthetic heart valves.[1] The technique works on the basis of the differences between the acoustic resonant modes displayed by intact and fractured valve struts. The defect detection problem is complicated by the fact that the signal from the heart valve is mixed with signals from other parts of the body (e.g. heart, lungs, GI tract, noise), which have similar frequency content. Similar situations have also been shown to arise in the area of acoustic emission based nondestructive evaluation. [2] In this paper, we describe the EMAT technique and a signal processing technique for the blind source identification of signals from the heart valve. Results showing the effectiveness of the method in rejecting unwanted acoustic signals are presented. Other possible applications of the technique in the area of acoustic emission NDE are also discussed.