1.3.87. PHASE VELOCITY METHOD FOR LAMB WAVES IN PULSE ECHOES

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In guided waves applications, it is very important the identifications of modes in wave propagation. It is well know for the case of plates that we can use an angular transducer to obtain a specific mode through a Snell law which relates the angle of the plane incident waves (i.e. in an acrylic). Viktorov (1967) and Rose (1999) explain reviews of the theory for the excitation of Lamb and Rayleigh waves for these cases. Then, one of the ways to excite Lamb waves is the use of a variable angle transducer. This approach is the most efficient, since Lamb waves propagate in only one direction. For this case we are able to select different modes thorough an adequate angle.

The problem arises when an echo is obtained from a reflector, which could be a flaw or a natural boundary of the plate. In this case the mode received could be differently than the mode that has been sent.

Previously works (Moreno and Acevedo, 1998) have shown that it is possible to use the method of phase velocity for thickness measurements using pulse transmission technique in plates. The objective of this paper is to presents a method for measuring the phase and group velocities in a plate after a pulse reflection by a notch. Experimental values are compared with dispersion curves of Lamb waves. Although this kind of dispersion is well know, a Semi Analytical Finite Element Method or SAFEM, is presented developed as a general software, which could include pipes and rail for the future.

The results are described, from the physical point of view, by the use of Finite Element Methods simulation (FEM) in a similar way as described by Castiangs (2005). But in this case the waveform is obtained at different point over the plate describing a similar situation of the measuring of the phase velocity method.

From the experimental point of view it was used a variable angle transducer from Krautkramer at 1 MHz over a steel plate of 4.7 mm of thickness. The transducer was excited with a Panametric Pulser-receiver 5900 PR, and the echoes were displayed with a digital oscilloscope connected to a PC.

References:

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