

1.3.48. UMASIS, AN ANALYSIS AND VISUALIZATION TOOL FOR DEVELOPING AND OPTIMIZING ULTRASONIC INSPECTION TECHNIQUES

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Simulation tools are more and more used during the development and optimization of ultrasonic inspection techniques. Their advantages are clear; They provide additional insight in the performance of an inspection technique at lower cost compared to a purely experimental approach. Furthermore, they overcome practical limitations like availability of transducers and test blocks during the design of new techniques. There are already a number of modeling tools available; most of them use ray-tracing or semi-analytical Kirchhoff integral methods for fast calculations. They solve approximations of the full elastic wave equation and therefore do not take into account all wave phenomena. These algorithms also limit the visualization possibilities; essentially they provide a simulated A-scan.

UMASIS is a software tool that takes a different approach. It uses the power of wave equation based forward modeling to calculate the full elastic wave field. All wave phenomena, like mode conversion, are automatically taken into account. Furthermore, the calculation of the wave field allows advanced visualization possibilities, like full wave field visualization and decomposition in P- and S-waves.

Several cases show that UMASIS can successfully be used to optimize inspection configurations or even complete ultrasonic inspection tools. The combination between comprehensive forward modeling and advanced visualization capabilities turns-out to be a powerful tool to understand the underlying complex physics, without the need of in-depth understanding of the modeling algorithm.