HYBRID & SURROGATE MODELS: NEW TRENDS AND APPLICATION OF SIMULATION SOFTWARE FOR NDT

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The CIVA platform is a well-known multi technique simulation and analysis software in NDT. Developed by CEA LIST, but also resulting from the contribution of numerous industrial and academic partners within Europe, the software keeps evolving to offer its user the best performance in terms of numerical efficiency, imaging, and reliability demonstration. CIVA can simulate UT, GWT, ET, RT, CT and TT methods and developments on new techniques are in progress. Simulation is often considered as a help to design inspection methods in order to minimize the number of iterations when building probe prototypes, optimizing inspection techniques and defining the test procedures. But it is also very useful to support performance or reliability demonstration that require a lot of data (such as POD studies and qualification campaigns), and where simulation can help by reducing the number of necessary mock-ups and experimental trials. Initially based on pure semi-analytical modelling approaches, selected for its ability to reach fast computation times, the current trend is to merge numerical models with semi-analytical ones in order to benefit from the advantage of both approaches and find the best compromises. For instance, the UT module of CIVA embeds now such hybrid approach with several Finite Elements models to account for more complex phenomena in the wave/flaw interactions and realistic complex shape flaws description. In addition to physical models, CIVA also now offers meta-modelling techniques. Build from an initial set of physical simulations, such surrogate models give the user the possibility to generate a massive amount of results while combining and exploring multi parametric variations. This is particularly efficient in the context of sensitivity analysis for optimization, reliability and POD studies, when you have to find the best settings or track the worst case scenario. This paper will illustrate the use of these new modelling approaches available in CIVA on different application cases.