Real-Time TFM in1 shot

Xavier Harrich[1], Christophe Chollet[2]

[1]Sales, Socomate International, France, [1]Marketing, Ekoscan, France

In this paper, we will present a new advanced imaging method based on the Phased-Array technology and the Total Focusing Method (TFM). The principle of TFM imaging can be applied using different ways to inspect thick or thin plane parts or parts having complex geometry. Sliding TFM and adaptive TFM are based on the same algorithm to bring solutions to such situations. The main constraint regarding the capacity of TFM for real time imaging is the number of shots required to get all data. The most common process is the Full Matrix Capture which involves as many shots as elements on the phased array transducer. Fast TFM imaging was allowed using Plane Wave Imaging (PWI) where transmission of few plane waves reduces drastically the number of shots and increase the imaging rate. Our new approach for real time TFM (RT-TFM) relies on a single emission on all elements before to process in real time the TFM image. The goal of RT-TFM is to detect flaws at high speed, regardless of its shape, position and orientation. The principle is to insonify the inspection area in a single shot using all the elements, favoring no direction and no focusing. This makes it possible to reconstruct the signal in several directions from the signals received by each element of the Phased Array probe. This is possible using pseudo-random time shifts thus not favoring any wavefront construction. RT-TFM can excite all or partial number of elements of a Phased Array probe using to a pseudo-random time distribution to generate waves without any consistency between them. All returned waves from reflector are detected by each element of the probe, and the principle of the TFM reconstruction can be applied in real time It is there possible thanks to RT-FMC to obtain high resolution images similar to TFM but with a higher speed. We will explain this new technique and show various examples of real images achieved by FMC, PWI and RT TFM to compare the results.