The electro-acoustic performance of transducers has a direct impact on the performance of ultrasound inspections. The signal/noise ratio and the resolution (both axial and lateral) are key factors for detecting and/or proportioning the indications being sought. The signal/noise ratio partly depends on the sensitivity and the signal/noise ratio of the transducer itself. The axial resolution depends on the length of the signal and therefore, for a given maximum frequency, on the damping of the transducer.

Sensitivity and damping are often considered antagonistic, as damping traditionally reduces resonance and therefore sensitivity. Earlier studies have demonstrated the advantages gained through using piezocomposite technology to improve this compromise. These two parameters also depend on the acoustic adaptation to the coupling medium (water, plexiglass, rexolite, steel, etc.), and according to the design used, performance deteriorates more or less as one moves further from the nominal use.

In addition to sensitivity and the signal/noise ratio, other parameters such as the angular acceptance and resistance to abrasion are sometimes to be integrated in the expected performances.

This article presents the recent developments undertaken and tested in the context of improving the acoustic performance of multi-element probes:
- Identification of the components that influence performance;
- Simulations;
- Selection of the configurations that meet the needs of various applications;
- The experimental results obtained;
- Comparison with the simulations.

These studies have led to the development of a design expertise for responding to requests for custom-made, industrial, multi-element probes with improved performance, for production runs from a single item to dozens, even hundreds.

The detailed results will be presented, as well as the possibilities for future development.