Multiphysics Simulations in the Ultrasonic Industry

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Abstract

This work focuses on the application of multi physics finite element simulations in the manufacturing and application of high power ultrasonic machines.
Industries providing big power ultrasonic solutions as in: cleaning, welding, sonochemistry and cutting fields, already apply the finite element simulation approach, in the structural mechanics flavor, in the design and optimization of ultrasonic machine's specific parts as: transducers, horns, waveguides, boosters.
Despite this evolution there is still a gap between the ultrasonic machines manufacturers and the constantly increasing demand of high power ultrasonic technology which is coming from many different fields; this gap is mainly due to the many physics simultaneously involved in the potential applications. Another challenge is represented by the possibility to exploit new applications of the ultrasonic technology by quickly perform feasibility studies which can drastically reduce rather then avoid the manufacturing of prototypes and design of expensive experiments.
In this scenario the potentialities of multi physics numerical simulations can provide successful solutions and therefore help in the discovering of new applications of high power ultrasonic technology.