

Ultrasonic Transducers: Design & integration



For applications requiring high ultrasonic power, standard solutions can hardly be used as "plug and play" because of a lack of efficiency in the application. Most of the time, the direct use of standard ultrasonic transducers does not allow to transmit enough ultrasound in forced rate. Since increasing the power is generally expensive and often rather inefficient, it is important to design the appropriate sonotrode to control the acoustic field in the load.

Objective

CEDRAT TECHNOLOGIES combines standard ultrasonic Langevin transducers and designs the sonotrode to control the acoustic field that fits customers' applications. This adaptation may include FEA modelling with ATILA® software and mechanical interfacing.

Description

CEDRAT TECHNOLOGIES distributes all over Europe the Ultrasonic Industrial Processors (UIP), which are ultrasonic Langevin transducers made by Dr Hielscher and provides R&D services based on the integration of UIP and the design of the sonotrode.

»» Standard ultrasonic Langevin Transducers :

Hielscher's wide product range of ultrasonic processors for industry allows for a seamless scale up from lab samples to bench top or prototype units and most essential to full industrial scale. The power spectrum for the industrial applications reaches at the time from 12 up to 16,000 Watt per single processor.

»» Ultrasonic sonotrode design:

CEDRAT TECHNOLOGIES performs CAD modelling with ATILA® for electro-acoustic analysis: We design, optimise and build its piezoelectric transducers and their specific sonotrodes.

ATILA® gives also the resonance frequency, the antiresonance frequency and the effective coupling coefficient of each mode with a modal analysis. An harmonic analysis gives the complex impedance curve of the transducer. Using Finite Element Method, it is possible to compute every shape of sonotrode and also the complete transducer in 2D or in 3D.

The results of this computation is a sonotrode geometrically compatible with the application in terms of interfaces and the high power ultrasound output.

Applications

These ultrasonic transducers are used for many applications such as welding, cutting, homogenizing, emulsifying, fine sieving, acoustic cavitation, ultrasonic cleaning, aerosol generation...



Fig.1: CEDRAT TECHNOLOGIES sonotrodes.

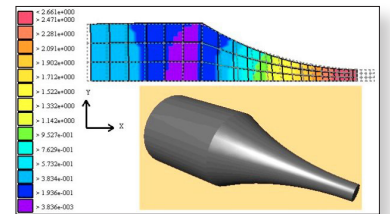


Fig.2: Horn sonotrode FEA.

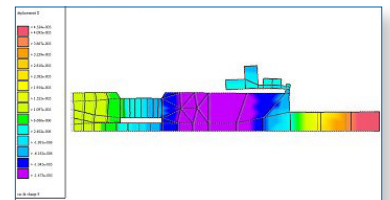


Fig.3: Transducers FEA.

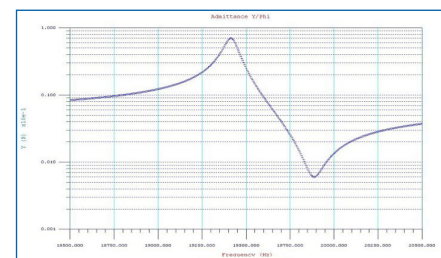


Fig.4: Electrical admittance of a piezoelectric transducer.