

## **Applications of Hammer transducers:**

1. Replacement of all traditional ultrasonic transducers in their known applications (Ultrasonic welding, cleaning, mixing, Sonochemical reactors...).
2. Simplified Ultrasonic Cleaning, using only one Hammer transducer and convenient ultrasonic resonant radiator. Easy to avoid Telsonic and Martin-Walter patents for tubular and bar (Push-Pull) transducers.
3. Liquid metal (or plastic, glass, ceramics, composites etc.) treatment from a long distance (to avoid heating of transducer: for metal and plastic founding, casting, injecting, micro-crystallization, micro alloying, polymerization, vulcanization, de-vulcanization...). Plastic molds treatment in the process of plastic solidification.
4. Accelerate aging of materials, residual stress deliberation/release and structural stabilization of material properties... Residual stress deliberation in ceramics, piezoceramics, glass, metals, plastics, composites...
5. Simplified Ultrasonic Welding (metals and/or plastics). New possibilities regarding ultrasonic and low frequency vibration for welding of plastics and metals.
6. Ultrasonic agitation of molds and metal forms in the process of plastic (or metal) solidification. Easy penetration of ultrasonic waves trough thick metal walls.
7. Electro-resistive, arc welding assisted by ultrasonic vibrations.
8. Metals & Plastics extrusion and injection assisted by ultrasound. Applicable for composite materials which are difficult for extrusion (as well as for traditionally known materials).
9. Metal forming assisted by ultrasound. Forging, stamping... of metals assisted by ultrasound. Hydraulic, high-pressure tube forming assisted by ultrasound.
10. Liquid degassing, homogenizing, mixing... (for liquid metals, plastics, or any other liquid).
11. Degassing, bauble and oxide removal in galvanic, metal plating baths.
12. Degassing, bauble and solid stone layers removal in boilers (central heating, electric power plants, nuclear power plants...). Faster heating and accelerated heat exchange, because bauble layer will not form on the boiler and heater walls.
13. Transport of high ultrasonic power to a remote place using metal bars, or flexible acoustic waveguide lines.
14. Seismic vibration sources for petrochemical and geological research and diagnostic. Seismic NDT transmitters and receivers: Seismic scanning (tomography) and seismic spectral analysis. Seismic communications (on a very low and high frequency...).
15. Driving/agitating of very high density and very viscous materials. Heavy loaded ultrasonic applications.
16. Sintering assisted by ultrasound in the phase of powder compacting, and, also, during thermal treatment.
17. Machining/cutting of hard materials/metals, assisted by ultrasound.
18. Ultrasonic + Electro-erosion (arc) metal cutting assisted by ultrasound.
19. Linear vibration transporters.
20. Ultrasonic liquids filtration.
21. Ultrasonic Flowmeters in the most difficult applications: High temperature, very thick tube walls, high operating pressures...
22. Specific ultrasonic measurements of material properties: Acoustic impedance, attenuation,... acoustical bridges...in heavy-duty conditions.
23. Ultrasonic drilling and cutting of very hard and brittle materials.
24. Thermal treatment assisted by ultrasound.
25. Vortex ultrasonic sources.
26. Underwater communications (sonar, radar...). Much higher efficiency than in the case of traditional transducers.
27. Sonochemistry ultrasonic reactors.
28. Water treatment, decontamination, and sterilization...Waste water treatment. High density and high viscosity, complex liquids can easily be agitated using Hammer transducers, because mechanical load will not influence high efficiency operation of transducer.
29. Applications combined with laser sources...(Hammer Laser Transmitter)
30. Applications in dangerous, explosive and aggressive environments...
31. Possible applications in nuclear industry...
32. Possible applications for military purposes...
33. Possible applications for medical therapy...(body massage)
34. Pulped paper applications. Opening the paper pulps during paper production.
35. Elimination of biological colonies, shells and algae in water supply reservoirs and water conduits (regarding to wide band frequency sweeping).
36. Sonar: Improved underwater communications. Minimized transducer hardware.
37. Thermal treatment of metals inside of molten salts tanks. Better heat exchange and ultrasonic structure modification in the same time.