

Design of a Mechanical Resonant Station to Free Jammed Micro Mechanisms

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Abstract

Some types of mechanical devices, such as molds, but not only, include a large number of micro-mechanisms, valves, channels, vents, or other devices subject to deterioration or malfunctioning, frequently caused by unwelcome phenomena such as incrustations, fillings, or reciprocal bonding and adhesion of parts following prolonged periods of intense use.

Standard cleaning techniques (wet washing with detergents, sandblasting, cleaning with high power lasers, ultrasonic cleaning with chemical solvents) can be highly automated and optimized in terms of time and costs, but they can't solve the problem of blocked micro-mechanisms. It is therefore understandable why it is so important the invention (patented) of a resonant station that allows the easy unlocking of all micromechanisms at the same time. The station consists of an electromechanical transducer and a closing clamp, which operate in such a way that at least one mechanical resonance mode of the system of is excited. For example, a frequency range of considerable practical interest for the purposes of the device is that between 20 kHz and 24 kHz, hence in the ultrasound spectrum.

COMSOL Multiphysics® FEM was essential for the project, in order to obtain the following results:

- design of the electromechanical (piezoelectric) transducer, with high power and efficiency
- design of the closing clamp
- optimization of the mechanical resonance of the assembly

Figures used in the abstract

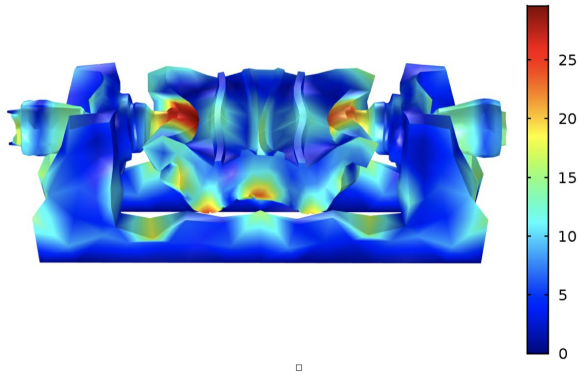


Figure 1: Design of a mechanical resonant station to free jammed micro-mechanisms, based on a high power ultrasound transducer.