Case Studies

Ultrasion's ultrasonic precision molding technology can process all polymer materials and grades including TPEs. In all materials, the reduced viscosity allows for the attainment of especially long parts or parts with extremely thin walls. The results achieved by some OEMs using the Ultrasion technology show the versatility of the machine and the precision achievable.

The following examples show the precision that can be attained, Ultrasion truly manufacturing the impossible.

TISSUE MANAGEMENT APPLICATION. Made from polypropylene. 43 mm long, weighing 0.22g, with wall thicknesses of 0.075 mm, and with an outside diameter of 0.35 mm and an inside diameter of 0.2 mm.

EYE RETINA SURGERY TIP. Made from raw polypropylene. Part weight 0.1g, with an internal diameter of 0.6 mm and a 0.17 mm wall thickness, and a wall thickness at the tip of 0.1 mm. The tool for this application used two extremely small core pins sitting head to head, which would have broken using the high pressures of conventional micro injection molding.

CAP WITH FILTER — EAR PROTECTION DEVICE. Made from raw polyamide 12 (PA12). Part weight 0.02g, with a 0.5 mm wall thickness, an outside diameter of 4.4 mm and an internal diameter of 2.9 mm. Part with a membrane overmolding was achieved in one operation, impossible using a conventional micro injection molding process.

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Ultrasonic Precision Molding
MANUFACTURING THE IMPOSSIBLE

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Tomorrow's **Precision Molding** Today

A trusted precision molding technology used by OEMs in the United States, Europe, and the Far East

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The Company

ULTRASION SL is a technology innovator based in Barcelona, Spain.

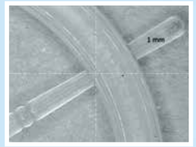
Central to the success of the company is its expertise in the industrial use of ultrasonics in a variety of applications.

With a globally respected reputation and reach, an increasing number of OEMs look to Ultrasion's technologies to ensure the optimisation of their business objectives.

Ultrasion offers ultrasonic solutions in the areas of deposition modelling (additive manufacturing), degassing of light alloys, and the optimisation of the pultrusion process.

Its most established and commercially successful technology to date is in the area of precision and micro plastic injection molding.

01. PRECISION MOLDING / **THE MISSION**



To make available to industry a precision molding technology solution that overcomes the drawbacks inherent in traditional injection molding, and which allows for the efficient and cost-effective manufacture of better quality, longer, thinner, and flatter parts than previously possible.

02. PRECISION MOLDING / **THE SOLUTION**

The Sonorus series of precision and micro molding machines that use ultrasonics as the key melting agent, and facilitate the short, medium, and high volume manufacture of precision plastic parts and components with superior accuracy, minimising waste and energy usage, with exceptional repeatability.

03. PRECISION MOLDING / **THE ACHIEVEMENTS**

The sale of precision and micro molding machines in the United States, Europe, and the Far East to OEMs, R&D facilities, and subcontract manufacturers all of which now benefit from this unique and efficient ultrasonic molding technology, which opens up design and manufacturing opportunities previously impossible.

04. ULTRASONIC PRECISION AND MICRO MOLDING / **HOW IT WORKS**

TRADITIONAL PRECISION MOLDING. Until Ultrasion commercialised its Sonorus precision and micro molding technology in 2011, all micro molding technologies were scaled down versions of macro molding technologies.

As such, they were over-engineered solutions, with an unnecessarily large footprint, and high clamping and molding pressures not needed in precision molding applications.

In addition, all precision and micro molding technologies relied on the traditional screw, barrel, and heater band configuration which is both cumbersome and inefficient in terms of part quality, material wastage, and energy usage.

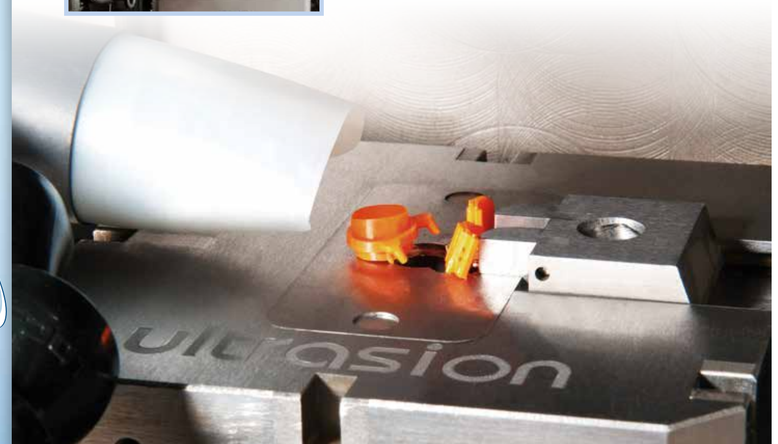
ULTRASONIC PRECISION MOLDING. Ultrasion's Sonorus precision molding technology was built from the ground up to address fundamental issues in plastic injection molding, key among which is material degradation.

Material degradation is a product of the residence time of melted plastic heated in advance of its injection into the mold. Residence time occurs in ALL traditional technologies that rely on screws, barrels and heater bands.

Ultrasion eliminates material degradation by removing screws, barrels, and heater bands and instead doses the precise amount of material needed per shot direct to the mold where it is melted in-situ using an ultrasonic horn (sonotrode).

The technology uses standard room temperature pellets which as they are melted and injected in one process eliminates residence time and therefore eliminates material degradation.

In addition, there is no purging necessary with the Sonorus ultrasonic injection molding machines and material wastage is reduced by up to 90% depending upon the precise nature of the application. In addition, as energy is only imparted as the sonotrode is in contact with the plastic to be melted per shot, 90% energy savings can also be achieved.



05. ULTRASONICS AS THE MELTING AGENT / **UNIQUE CHARACTERISTICS**

Plastic melted through the use of ultrasonics exhibits radically different and advantageous characteristics when compared with plastics melted through the use of traditional heater bands.

Key is that ultrasonic melting reduces the viscosity of melted plastic, this being a bi-product of the ultrasonic agitation itself which increases the free volume between the molecules in the melted polymer, and the fact that the sprue concept in the Ultrasion technology means that it behaves as an energy director as well as part of the ejection system. The energy director orientates the waves in the flow direction, therefore the molten material and waves travel together toward the cavities, reducing the viscosity of the polymer.

The high intensity mechanical vibration transmits energy directly into the polymer molecular structure resulting in a very fast and efficient melting "inside-out" rather than "outside-in" which is typically how melting occurs in injection molding via electric heaters. This particular characteristic of the ultrasonic molding process means that 15 mm long parts with wall thicknesses of 0.075 mm are easily attainable. Achievable tolerances are as tight as 0.01 mm.

Reduced material viscosity also means that the molding pressures required are much reduced over traditional micro molding technologies, typically in the range of 300-500 bar as opposed to the 1500-2000 bar that molders are used to.

This means that there can be tooling cost savings as there is less wear and tear, but more importantly means that it is possible to use delicate and precise core pins and insert configurations that would break under normal micro molding pressures. The low molding pressures also make the ultrasonic precision molding process ideally suited to over and insert molding applications, with success being achieved with no damage to the overmolded parts.

KEY FEATURES OF ULTRASONIC PRECISION MOLDING

- ELIMINATES THE NEED FOR SCREWS, BARRELS, AND HEATER BANDS
- ELIMINATES RESIDENCE TIME
- ELIMINATES MATERIAL DEGRADATION
- NO PURGING NECESSARY
- MASSIVE WASTE REDUCTION
- SMALL FOOTPRINT
- REDUCED MATERIAL VISCOSITY
- REDUCED MOLDING PRESSURES
- REDUCED CLAMPING FORCES
- IDEAL FOR OVER AND INSERT MOLDING
- HUGE ENERGY SAVINGS
- REDUCED TOOLING COSTS