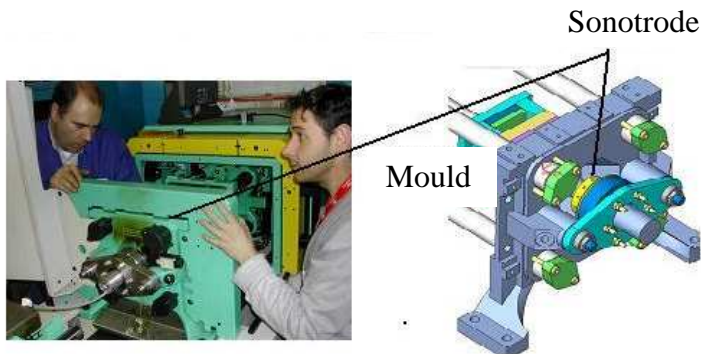


Innovative solutions

**A new and completely innovative technology
for producing small parts**



This part has been made with the new moulding machine using ultrasound. It is 2 mm in diameter. A new mould has been developed especially adapted to the ultrasound requirements. The second figure shows the part enveloped in a feeding ring that is slightly different from conventional mould tapping systems.

Micro-injection consists of obtaining injected micro-parts with a weight of less than a tenth of a gram and great dimensional precision requirements. Mini-injection encompasses ranges of between tenths of a gram to just a few grams. The ASCAMM Foundation Technological Centre is working in this field in which it has been developing innovative solutions for several years now.

When tackling the production of this type of part by applying the same criteria used for the conventional injection of larger parts, the most important challenge lies in adapting the technology to a series of essential processing differences in micro-injection compared to conventional injection.

- The tiny size of the parts usually makes it necessary to perform the injection using a high injection speed and with great pressure in a single phase comprising filling-total compactation. The small quantity of material injected requires the cycle times to be as short as possible.
- As a rule, the deadheads and cold tapping systems used represent up to 75% of the injected volume.
- Basically, injection presses require the configuration of worms with a small diameter (about 10, 12 or 14 mm), with which to achieve a high specific injection pressure on the material, or dispensing mechanisms by extrusion by means of a small piston with high precision for pushing the melted resin through the flow nozzles and channels.
- It is necessary to use microgranulate (non-standard) for feeding the small-diameter worms.
- In polymers that are sensitive to heat, as in conventional injection, the risk of the material becoming degraded due to the time it remains in the plastifier continues to exist and so the volume injected must be adjusted in order to cool it down in sufficient measure, and cold tapping designed to meet specific needs.

Due to the enormous boom that micro-injection is undergoing, injection-press manufacturers are developing smaller machines, with different degrees of success, based on designs that correspond to larger, conventional machines and in some cases, introducing adaptations that allow specific micro-injection needs to be met.

The ASCAMM Foundation's Technological Centre has designed and patented an innovative system for manufacturing plastic parts with mini and micro dimensions by the application of ultrasound devices.

Ultrasound devices have long been used in the plastics industry with different objectives: as one of the best welding technologies, for improving fluidity and homogeneity when installed in the machine nozzle, in order to favour the expulsion of the parts, etc. However, the application of vibration by ultrasound to the melting of a small volume of plastic material shows enormous potential, although there are no commercial references indicating that this possibility has been used to advantage.

From here on, we have developed a new melting system based on ultrasound, a new concept in moulds and finally a mechanical solution has been defined that allows all the elements to be rolled into one, facilitating all the movements required by the full moulding by ultrasound process.

These are the conclusions drawn after developing the machine prototype and after experimenting with this new process:

- It is possible to fill tiny cavities with melted plastic by applying ultrasound with an adapted sonotrode.
- The sonotrode acts by producing the necessary energy for melting the plastic and also generates the necessary pressure for moulding the parts.
- Thanks to the vibration produced by the ultrasounds, it is possible to inject parts, reproducing the mould exactly and with high surface quality by applying a considerably lower pressure than that required in conventional injection processes for micro parts.
- The process is almost instantaneous (it only lasts for several tenths of a second).

The results obtained in the Microplast project are a first step in adding a new, completely innovative technology to those already existing in the market for manufacturing small parts. The prototype developed makes it possible to envisage an extremely compact machine for the future, with a high marketing potential in the micro and mini parts market, a potential that is encouraged by emerging sectors such as the electronics and medical sector which still continues to grow.