



# Company Introduction

*... Molding the impossible!*

## *Our Inspiration*

***“If you want to find the secrets of the universe, think in terms of energy, frequency and vibration.”***

*- Nikola Tesla -*



## *Our Mission*

***Removing all the design boundaries of the products that improve people’s life by developing and spreading, a more efficient, cleaner and capable technology.***

## *Our Motto*

***...Molding the impossible!***

## **I. Historical Background**

## **II. Ultrason SL**

II.I Who we are?

II.II Where are we?

## **III. UltraSonic Molding (USM™)**

III.I Introduction. What's USM™?

III.II Sonorus Platforms

III.III Polymers

III.IV Applications



# I. Historical Background

## WWI & WWII

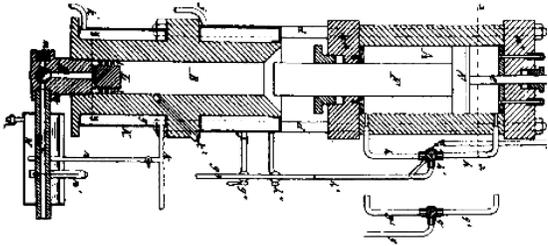
High demand for mass production articles

## Medical & Electronic Markets

Push for miniaturization

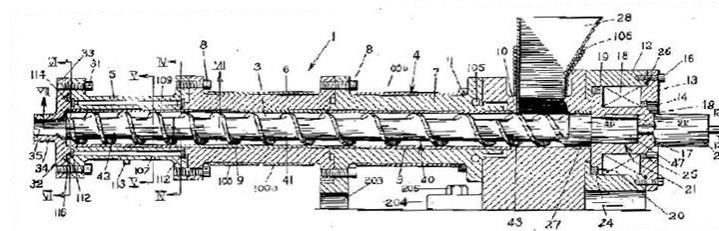
1872

Hyatt brothers patent the 1<sup>st</sup> Injection Molding machine



1946

James Watson Hendry develops the 1<sup>st</sup> reciprocating screw machine



1995

1<sup>st</sup> Micromolding equipment.  
Splitted Plasticization and Dosing



# I. Historical Background

- In the early XXI Century, state of the art micromolding solutions were characterized by their **oversized features and instability.**

- **Downscaling** old injection molding technologies quickly enabled the first micro-injection models, but these kept some constraints of the previous generations.

- To push the design boundaries found in previous technologies, Ultrason SL founders decided to **start from zero designing a machine fully intended for micromolding.**

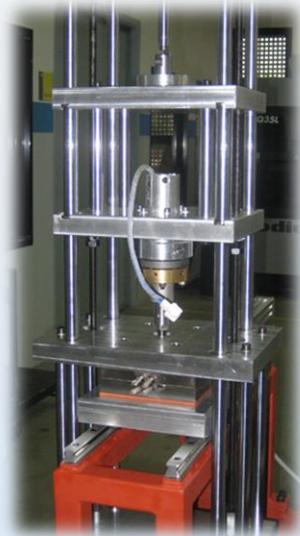
## Market Trend

High demand for higher production volumes part pushes the industrialization of the technology

### USM Development

2005

Beginning of USM™ development



2011

Sonorus 1G development



2016

Sonorus 2G development

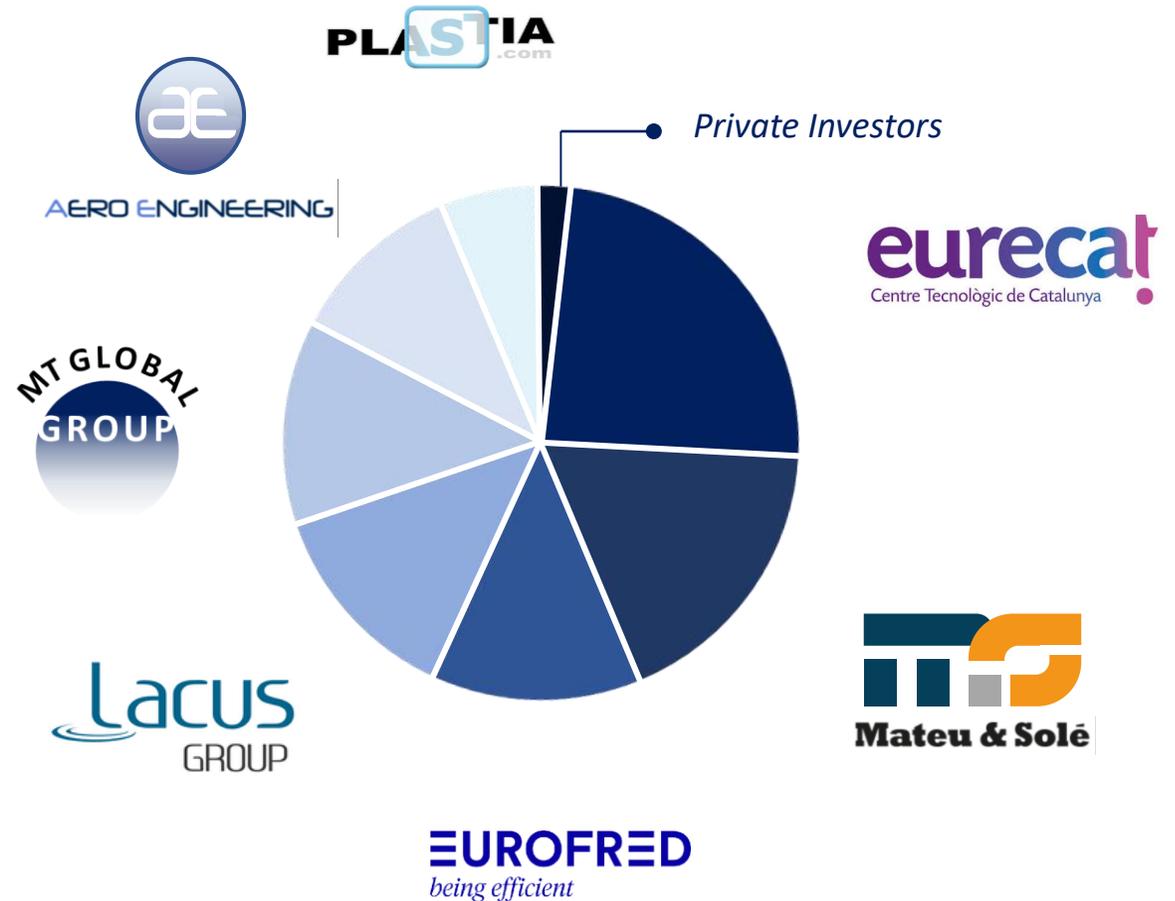


- *Shareholders*
- *Company evolution*
- *Applications*

## II.1 Who we are? - Shareholders

*Ultrason SL is shared by several companies and private investors from the industrial sector.*

*Among them, there are partners with a wide range of backgrounds like; companies with more than **75 years of experience manufacturing injection molding machines** (Mateu y Solé), a **Technological Center** (Eurecat) or **Industrial software developers** (Plastia).*

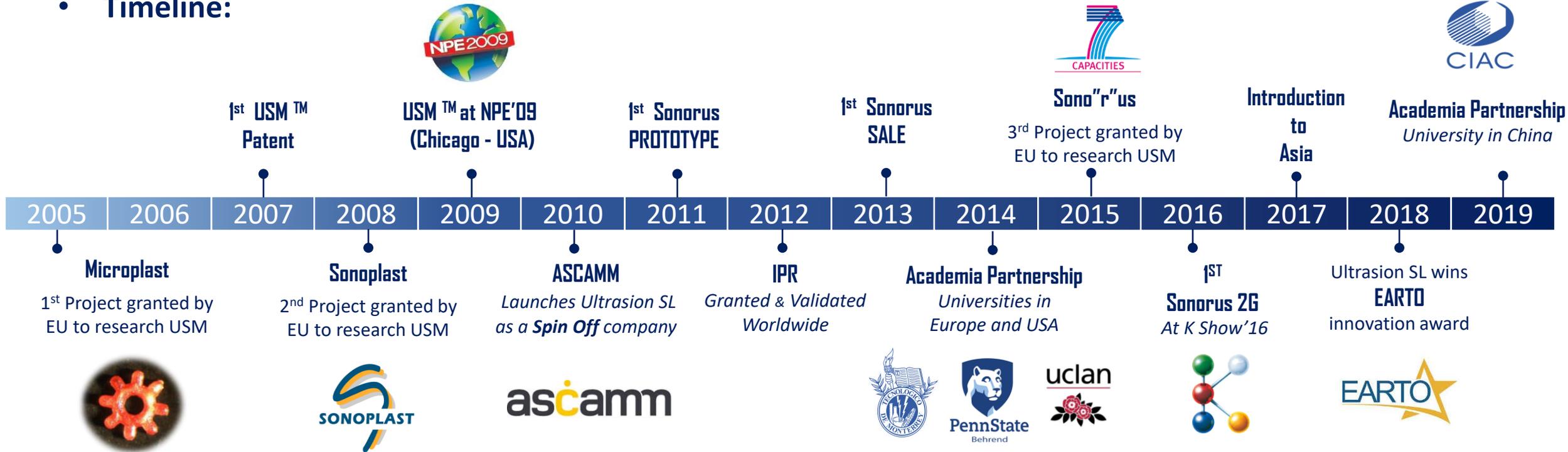


## II.1 Who we are? – Timeline

- **Ultrasonic Molding (USM™)** has been in continuous research by Eurecat (fka. ASCAMM), one of the most notorious Hi-Tech research centers in Europe, since 2005.



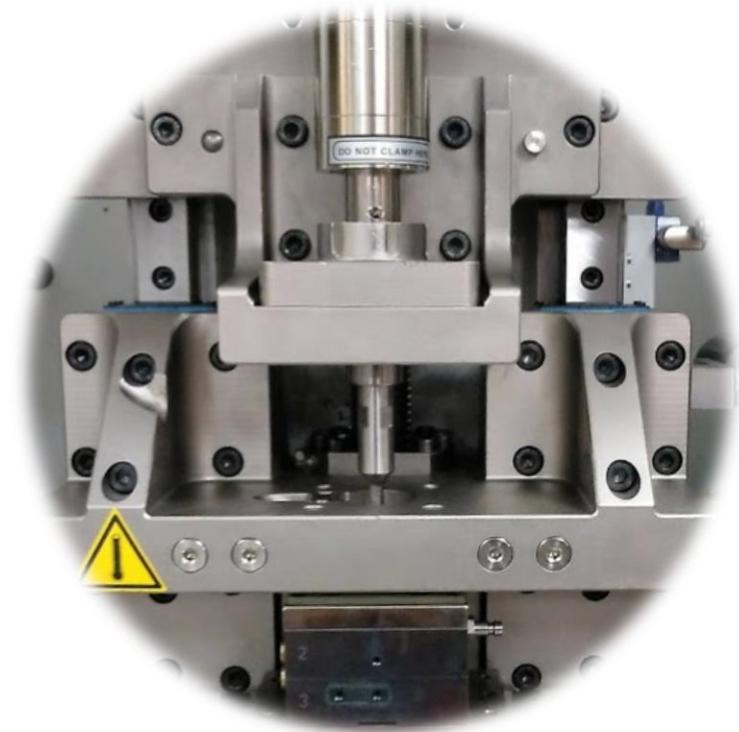
- **Timeline:**



- **USM™ (UltraSonic Molding):**

Thanks to the **replacement of conventional screws and heating bands by an acoustic unit**, USM™ improves the molding process making it more efficient and capable.

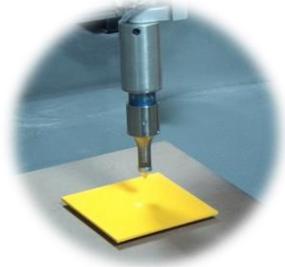
USM™ is the core value of Ultrason SL and the only commercially available technology from our portfolio of applications.



## II.1 Who we are? – Applications

- **UDM™ (UltraSonic Deposition Modelling):**

Alike conventional 3D Printing, UDM™ uses a hollow sonotrode instead of a heated nozzle.



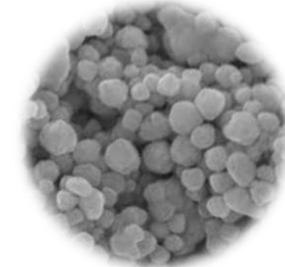
- **UMP™ (UltraSonic Micro Pultrusion):**

UMP™ is an enhanced pultrusion process that uses ultrasonic energy to form reinforced composites for high performance applications, micro devices and micro parts.



- **UNA™ (Nano additivation):**

UNA™ improves the dispersion of nano-particles through the pelletizing process applying ultrasounds to the extruder nozzle.

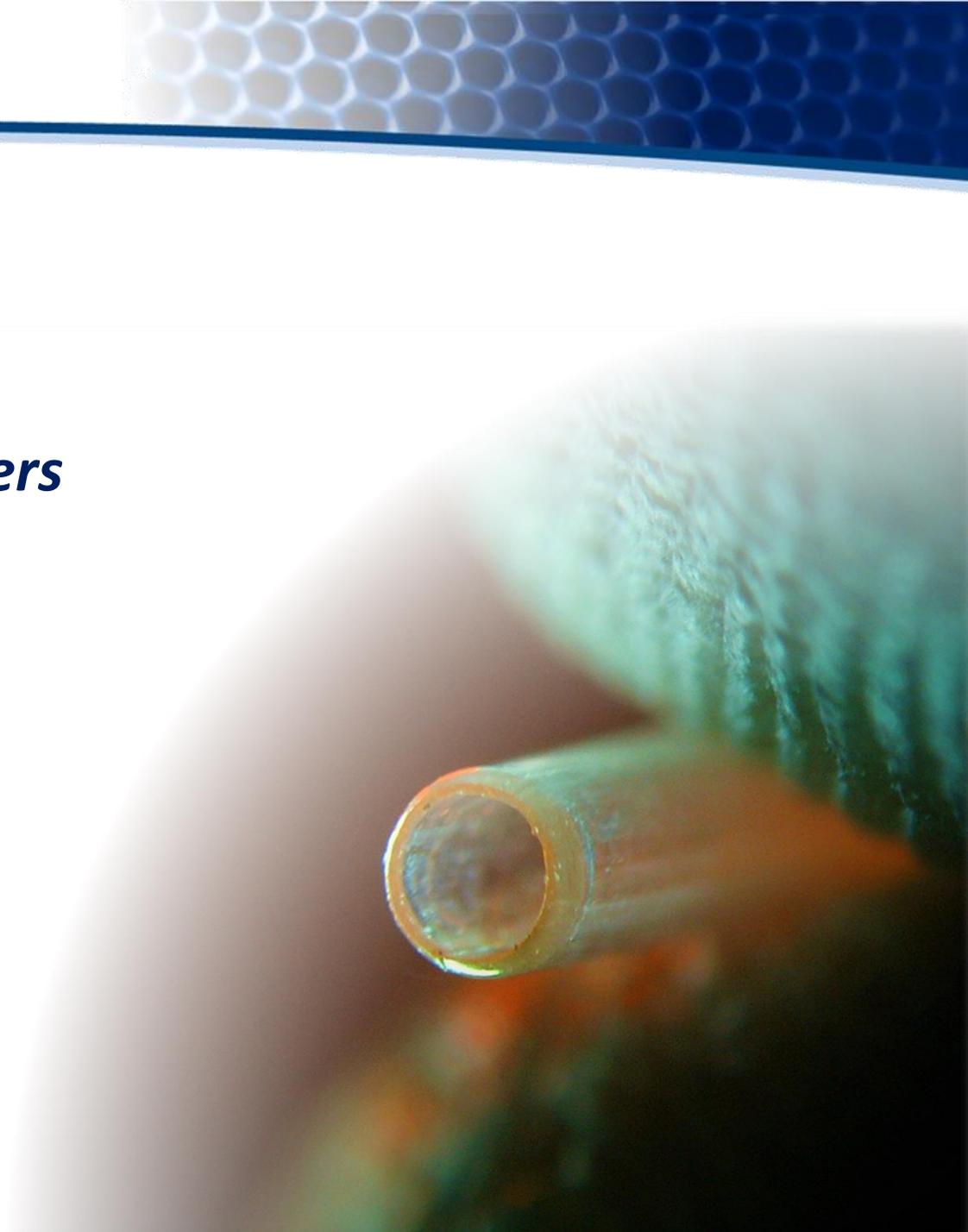


- **ULA™ (UltraSonic Light Alloys):**

ULA™ improves the degassing process of light alloys casts. The ultrasonic stimulation aids the elimination of bubbles reducing the porosity and the nitrogen content.



- ***Ultrason Headquarters***
- ***Academic partners***
- ***Customers***





SPAIN

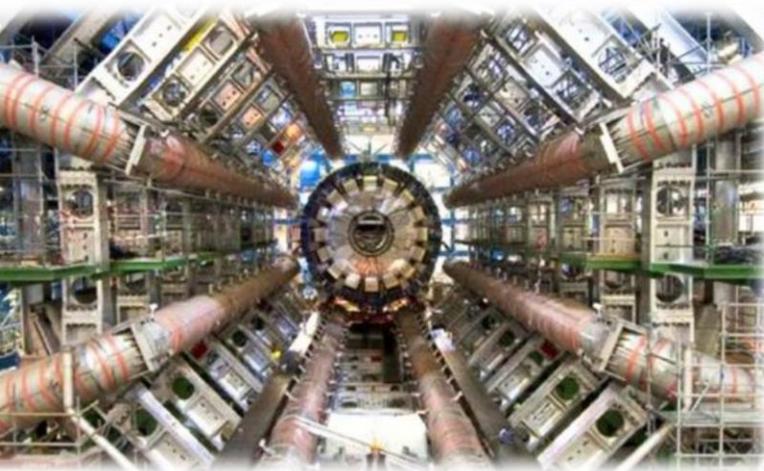


Europe

## II.II Where are we? – Headquarters



**ALBA  
Synchrotron**



*Our company is based in one of the cradles of European technology*



**Barcelona**

**1<sup>ST</sup> Submarine  
(1859)**

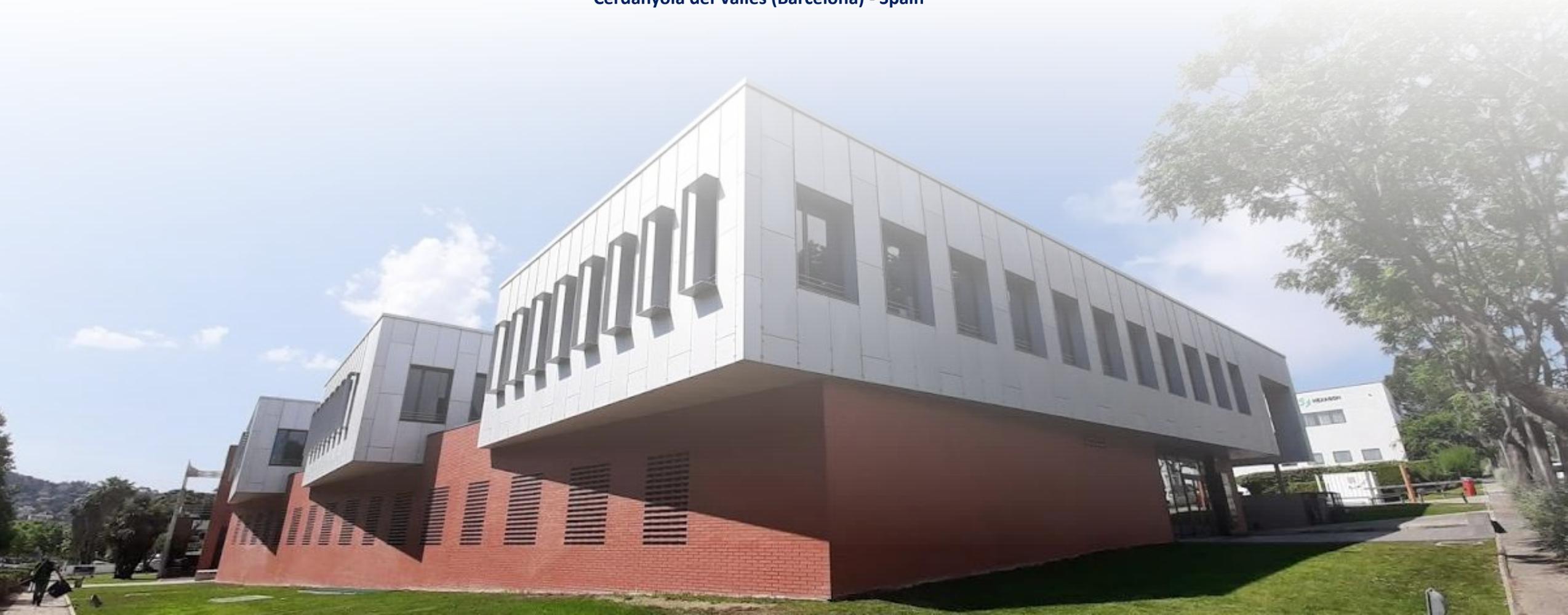


**Cholera Vaccine**



### ***Ultrason SL.***

Valles Technology Park  
Av. Universitat Autònoma, 23 – 08290  
Cerdanyola del Valles (Barcelona) - Spain



## II.II Where are we? – Academic partners

*Ultrason cooperates with universities and partners across the world to **increase the knowledge about the USM™ and validate new materials.***





### AMERICA

*Pennsylvania State University  
(U.S.A)*



*Monterrey Technology Institute  
(Mexico)*



### EUROPE

*University of Bradford  
(U.K)*



*University of Central Lancashire  
(U.K)*



*Universitat de Girona  
(SPAIN)*



*Universitat Politècnica de Catalunya  
(SPAIN)*



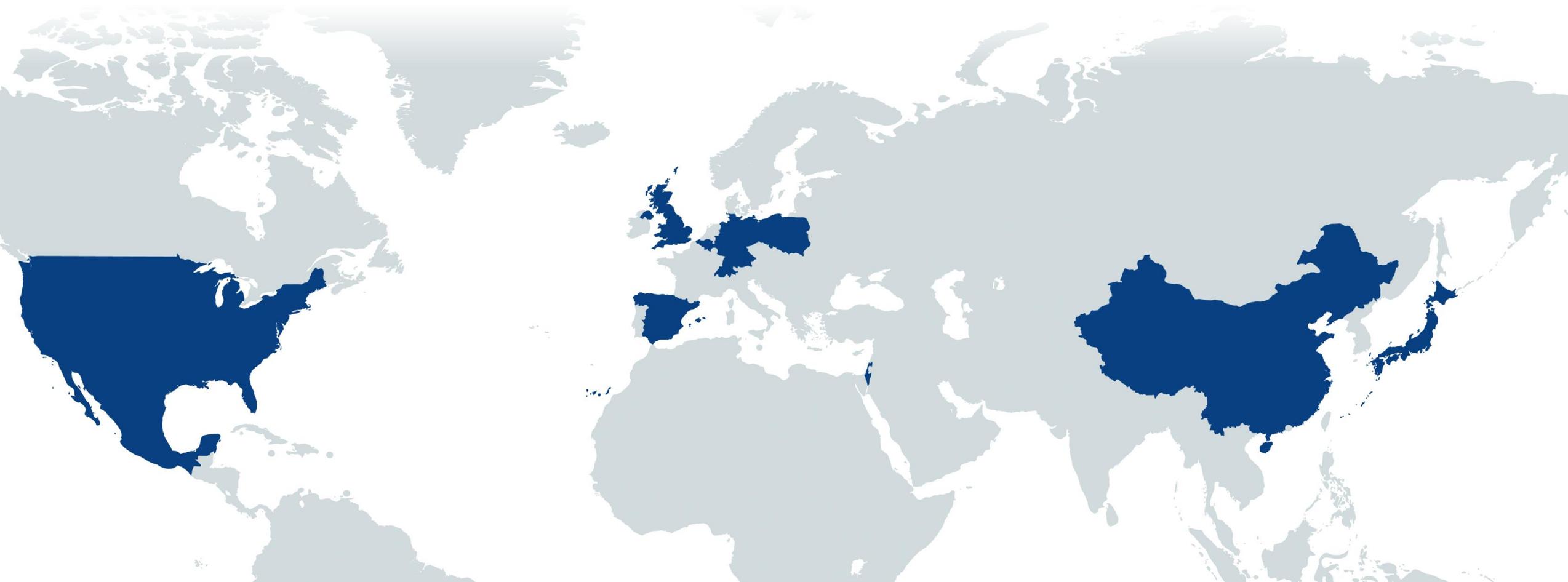
### ASIA

*Changchun Institute of Applied Chemistry  
(P.R.CHINA)*



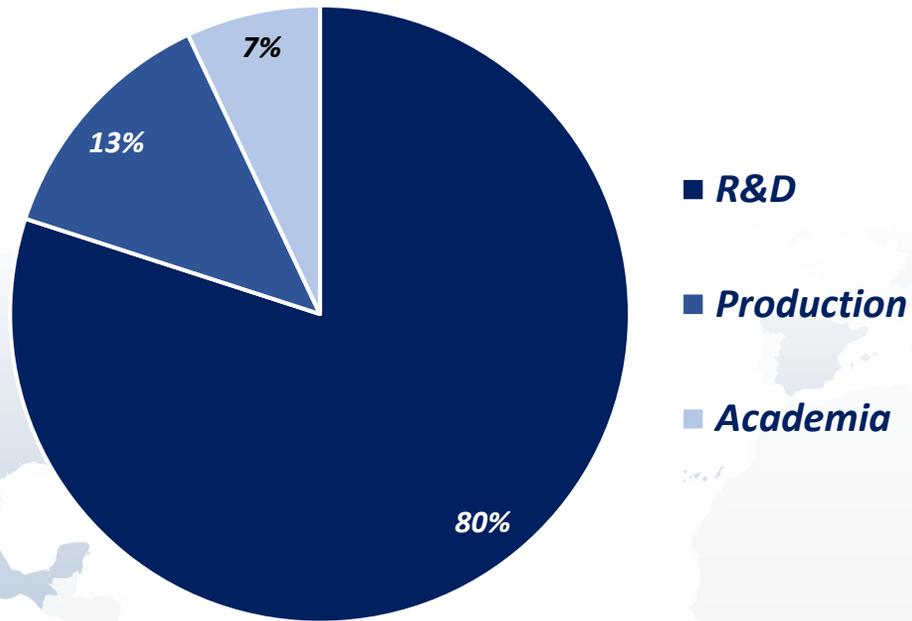
## II.II Where are we? – Customers

*With presence in the most demanding sectors, our customers are widely spreaded across the world with presence in the **Americas, Europe, Middle East and Asia***



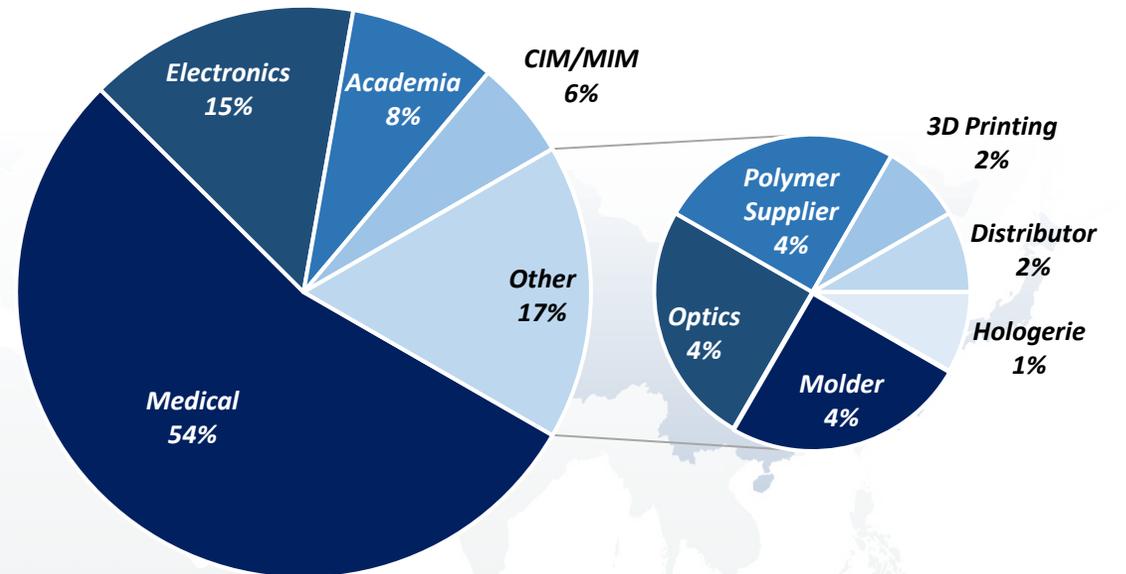
### Sonorus Environment

The Sonorus 1G is mainly used by our customers in the following environments:



### Markets

The main benefits of the technology arise when dealing with complex feedstocks or challenging applications. For this reason, our technology is mostly demanded in the following sectors:



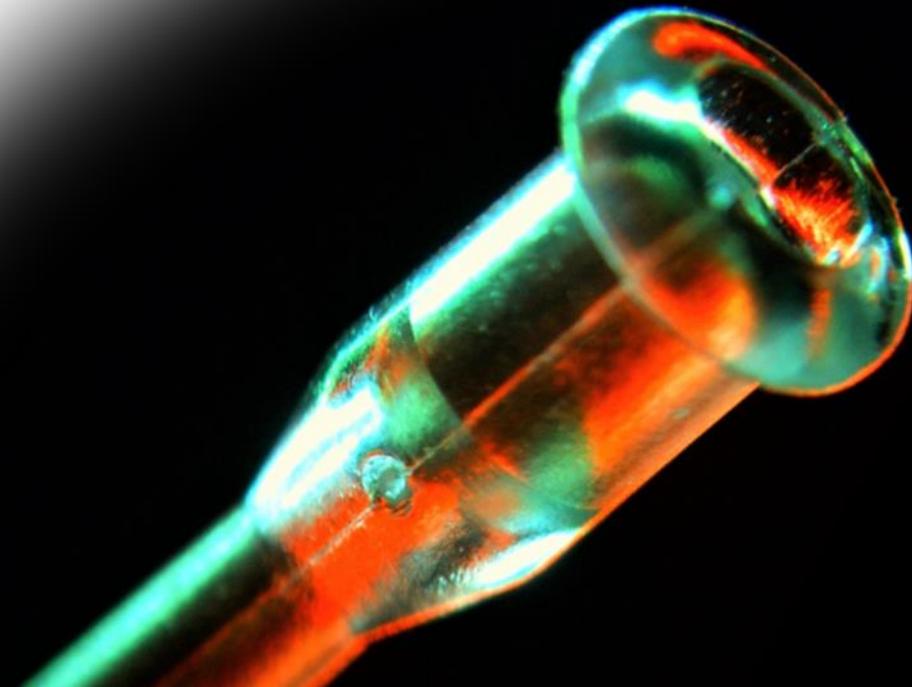
### ***I. What's USM?***

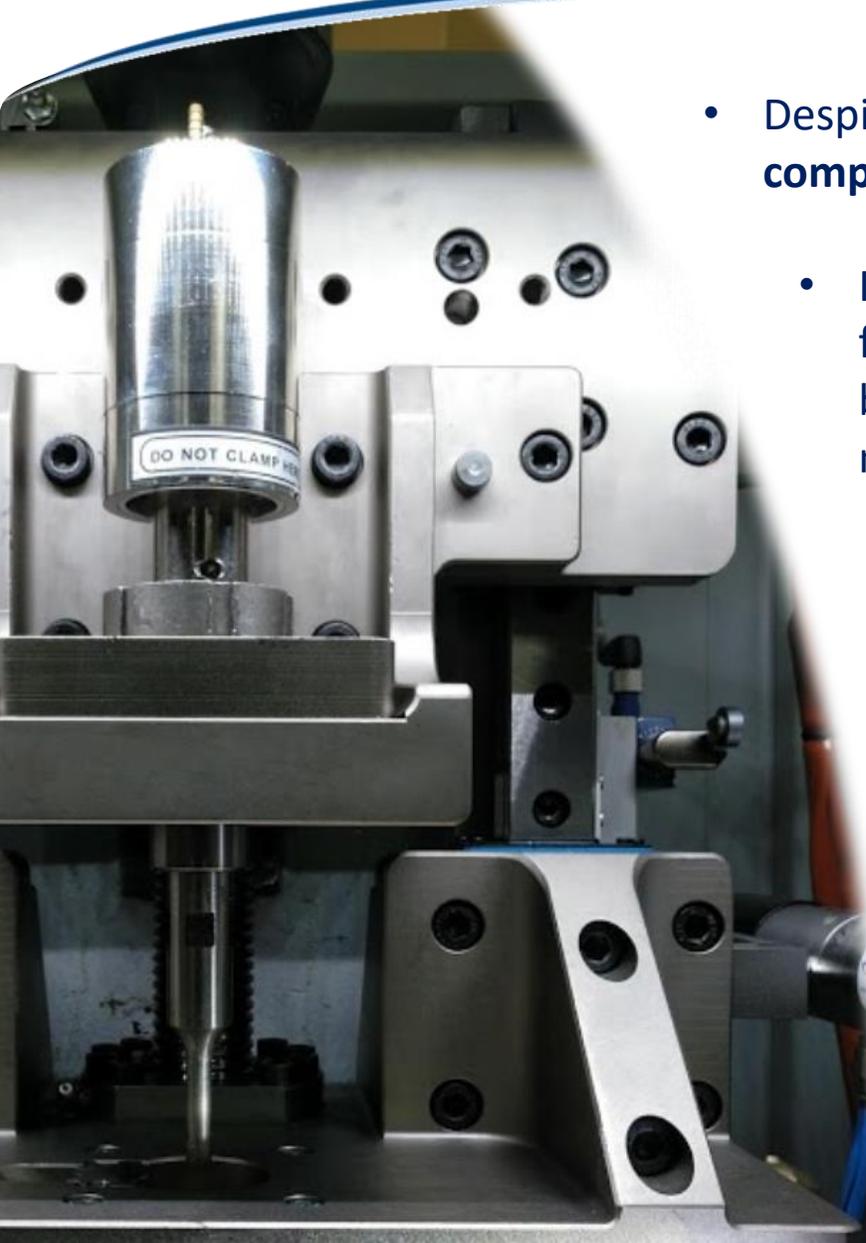
- ***Introduction***
- ***Benefits***
- ***Process Control***

### ***II. Equipment***

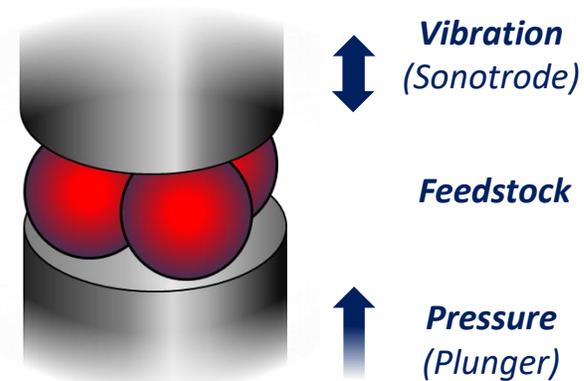
### ***III. Polymers***

### ***IV. Applications***





- Despite its similarities with traditional injection molding, the technology relies on a **completely different melting mechanism.**
- Inefficient screws and heaters bands are no longer required as the heat comes from the feedstock itself. The **intermolecular friction inside the pellets** caused by the ultrasonic wave generates the required heat in a fraction of the time needed by other technologies.



- The high efficiency of this heating method enables a **fast and local** (each shot is melted independently) **melting process.**

The acoustic system is composed by an ultrasounds generator and 3 components:

### *Transducer*



*Electro-mechanical device that converts a high frequency electric signal into a **30 kHz** vibration.*

### *Booster*



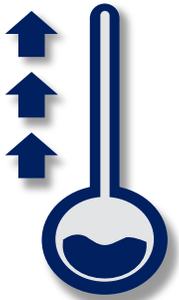
*Mechanical component that **increases the amplitude of the vibration** delivered by the transducer.*

### *Sonotrode*



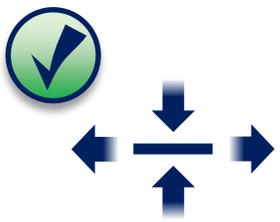
*Mechanical component that **increases the amplitude of the vibration** delivered by the booster and **transmits the energy to the polymer.***

The main benefits of the technology are:



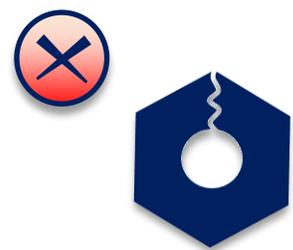
## Higher melt temperature

As the reduction of molecular weight (thermal degradation) is a matter of time and temperature, by significantly reducing the first one, USM equipment can process (if needed) the polymers at higher temperatures than usual, leading to:



## Flatter, longer and thinner parts

USM is second to none when the task is filling extremely thin walled parts.



## No weld lines

As the polymers are processed at higher temperatures, the presence of weld lines when two flow fronts meet is minimized.



### No purge

USM is a **Stop & Go technology** as the purge operation doesn't exist. That generates time and materials savings highly appreciated by our customers that generally work with expensive technical or bioabsorbable resins.



### No residence time

As **only the required amount of material per shot is melted at a time**. The polymer remains melted on a very small fraction of time, avoiding the most common source of thermal degradation.

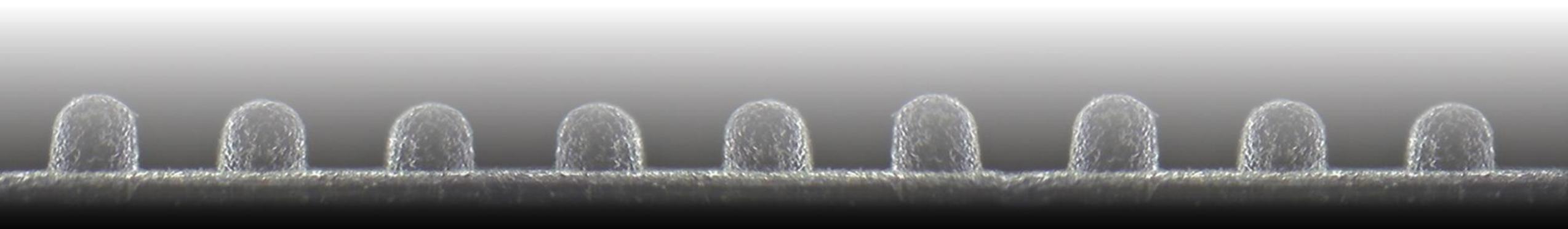
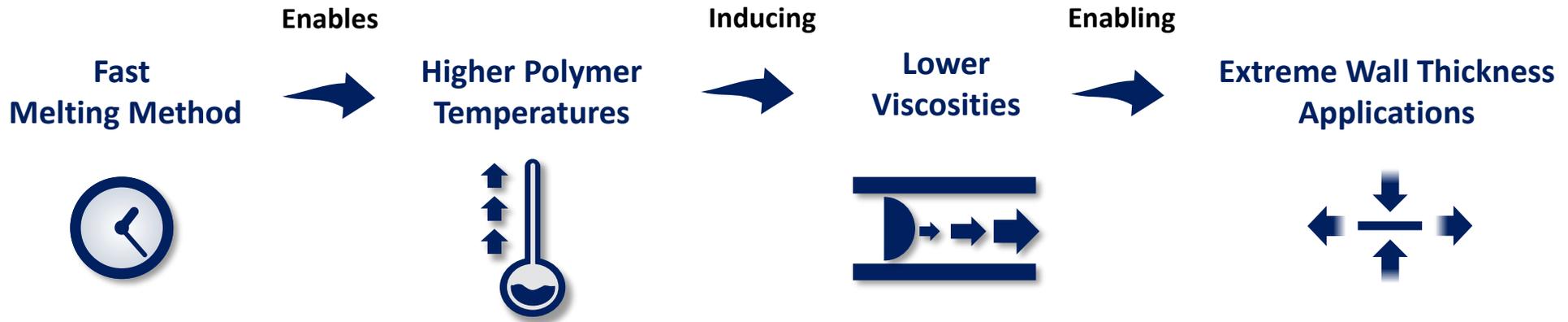


### High energetic efficiency

Thanks to the high efficiency of the ultrasounds and the lack of heating bands, the **energy savings can be cut up to a 75%\*** depending on the application (compared to injection molding).

## Summary

UltraSonic Molding allows a huge reduction of the energy consumption, reduces the waste of the process eliminating the purge operation and above all, it opens the design limits previously considered **allowing our customers to mold the impossible!**



## III. II Equipment

The **Sonorus 2G** is the second generation of Sonorus® equipment enabled with **USM™** technology. After spreading the technology with the previous equipment (Sonorus 1G), the press has been re-design to fulfil the increasingly higher production volumes required by our customers.



Its **larger size and increased capabilities** make it the best equipment for industrial environments.

The platform introduces new innovations in **USM™** like the fixation of the acoustic unit by multiple nodal points and the possibility of using **CFD software** to simulate the process.



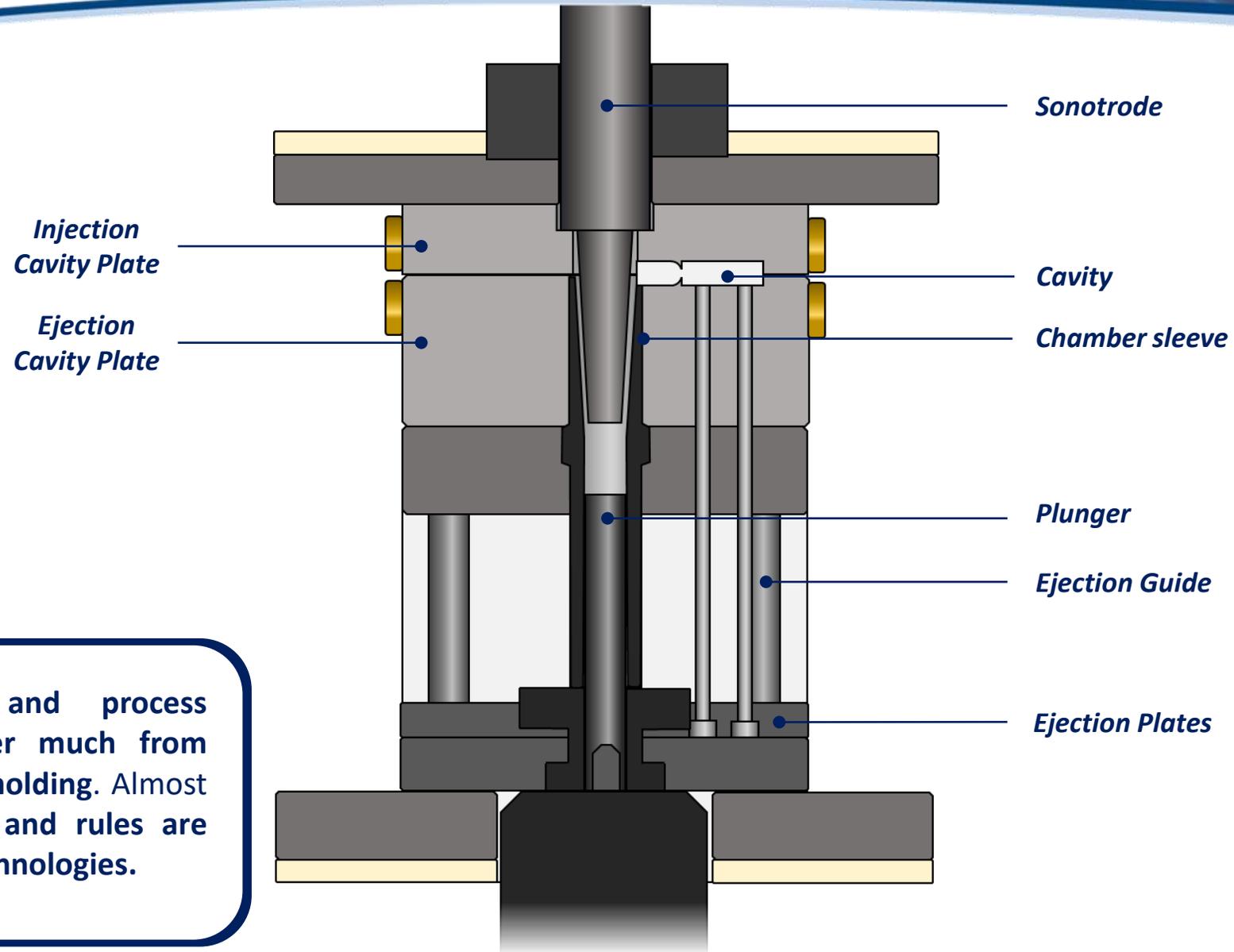
Technical Specification			
<b>Ultrasonic Generator</b>	<b>Frequency</b>	20-30-40	[kHz]
	<b>Power</b>	4000-1500-800	[W]
<b>Tooling</b>	<b>Cavity plate area*</b>	250	[cm <sup>2</sup> ]
	<b>Clamping Force</b>	10	[T]
	<b>Speed</b>	400	[mm/s]
<b>Plunger Axis</b>	<b>Max pressure</b>	4000	[Bar]
	<b>Speed</b>	150	[mm/s]
<b>Pick &amp; Place</b>	<b>Axis</b>	1	[x - y]
	<b>Euromap Protocol</b>	Yes	
	<b>Speed</b>	1000	[mm/s]
<b>Injection Volume**</b>		2,5	[cm <sup>3</sup> ]
<b>Thermal Package</b>	<b>Temperature zones</b>	2-4	Zones
	<b>Water cooled plates</b>	yes	

\*Max

\*\* Depends on the polymer & application

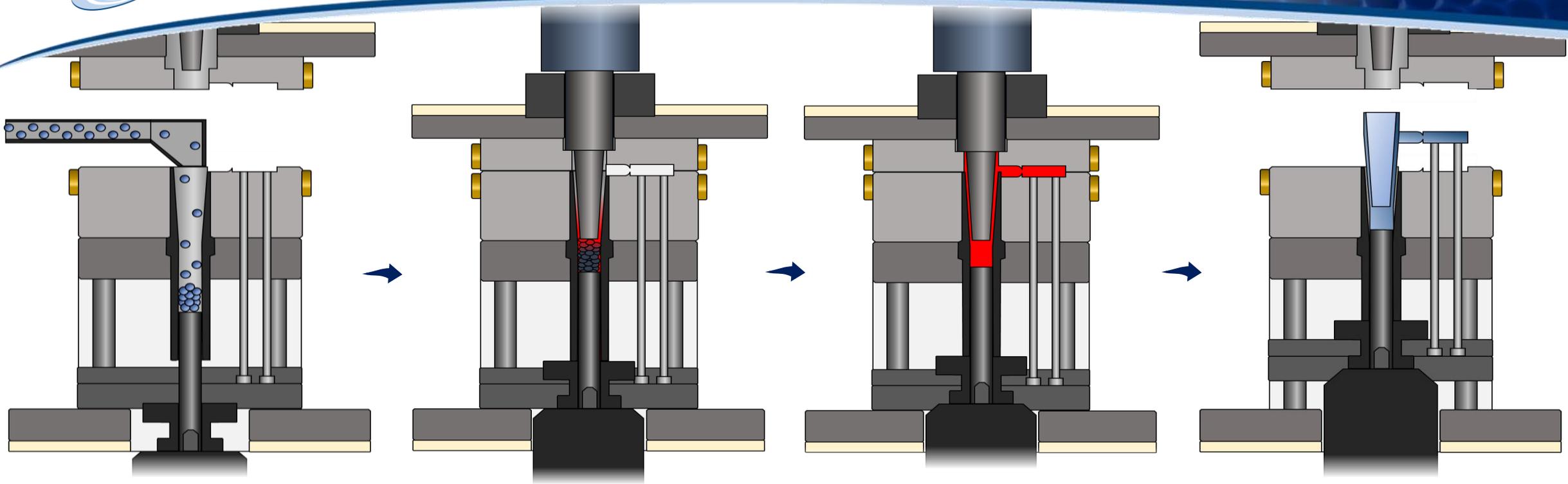


### III. I What's USM? – Mold



USM tooling and process control doesn't differ much from traditional injection molding. Almost all design guidelines and rules are applicable to both technologies.

### III. I What's USM? – Process Control



**Feeding**

*The feedstock is fed through the parting line at the beginning of each cycle*

**Melting/Injection**

*The vibration induced by the sonotrode combined with the pressured applied by the plunger heats the feedstock which flows between the sonotrode and the chamber sleeve*

**Cooling**

*As in Injection molding, the part must stay in the mold cooling down until it can be ejected without deformation.*

**Ejection**

*The plunger and the ejector system push the part out of the tool.*

### III. III Polymers

Although **USM™** was originally designed to process thermoplastics, through the years many customers have used it to mold parts with more complex materials. As a big part of our customers come from the medical sector, our R&D department is specialised in **Engineering polymers** (PEEK, PEI) and **Bioabsorbables** (PLA and its copolymers).

So far, applications with the following feedstocks have been moulded with our equipment:

- **Thermoplastics**
- **Elastomers**
- **Fluoropolymers**
- **Epoxy resins**
- **Ceramic injection molding (CIM)**
- **Metallic injection molding (MIM)**

Being **USM™** capable of processing the most common feedstock shapes (**pellets** and **flakes**), there is no need to customize the materials for our equipment. Our customers generally use materials from the main polymer suppliers like:

**ZEON**

**ARKEMA**  
INNOVATIVE CHEMISTRY

**'TORAY'**  
Innovation by Chemistry

سابك  
**sebic**

  
victrex

**RTP**  
Co.  
Imagining Plastics®

  
Corbion

**TOPAS**  
Advanced Polymers

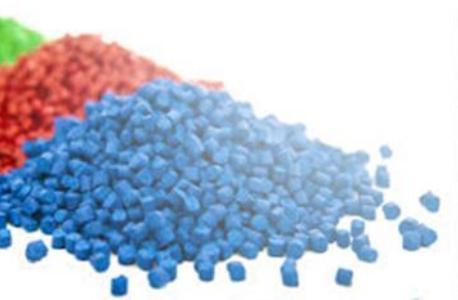
**DUPONT**

  
SIGMA-ALDRICH

  
**EVONIK**  
POWER TO CREATE

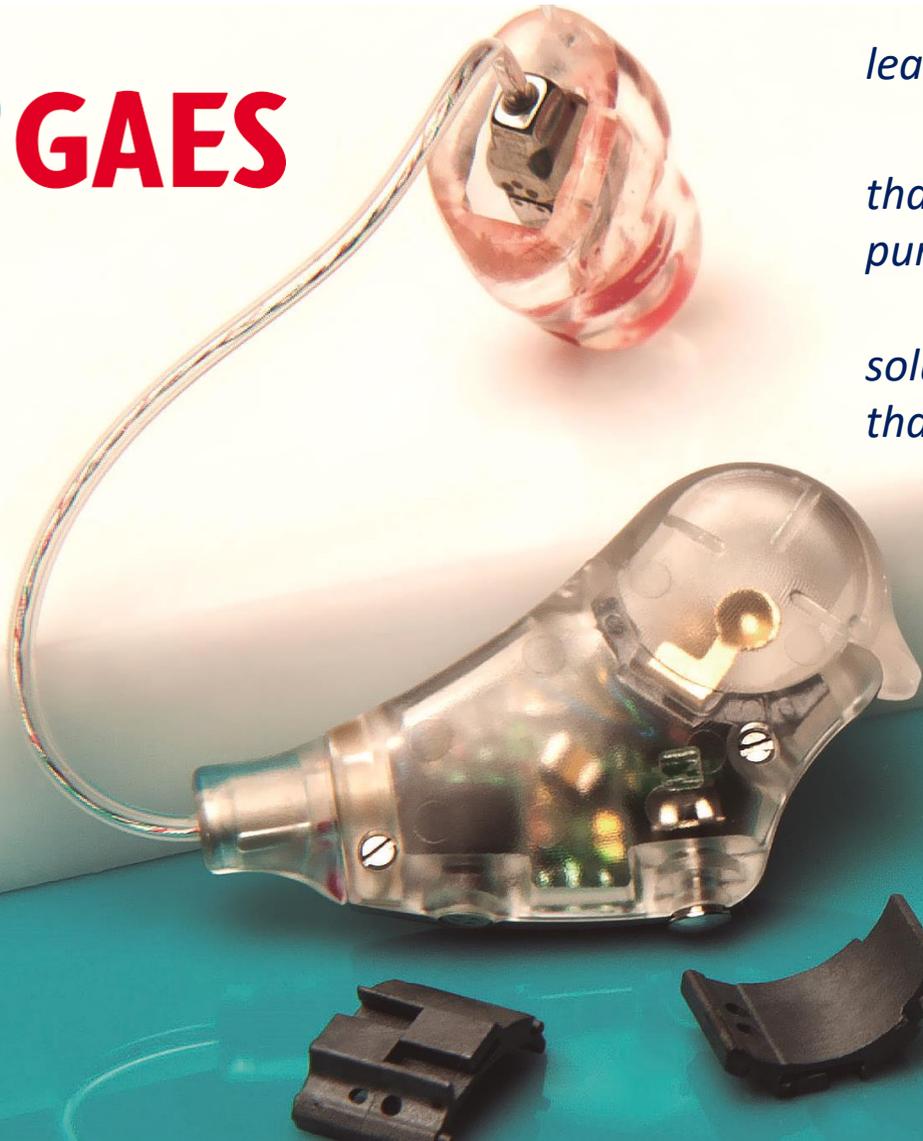
  
**Chemours™**

**PMB**



### III. IV Applications – Case study

 **GAES**



One of the early adopters of **USM™** was **GAES**, one of the European leaders in hearing aid device solutions.

Due to their short batch requirements, they needed a **Start&Go solution** that didn't require long warm up periods or wasting polymer through the purge operation.

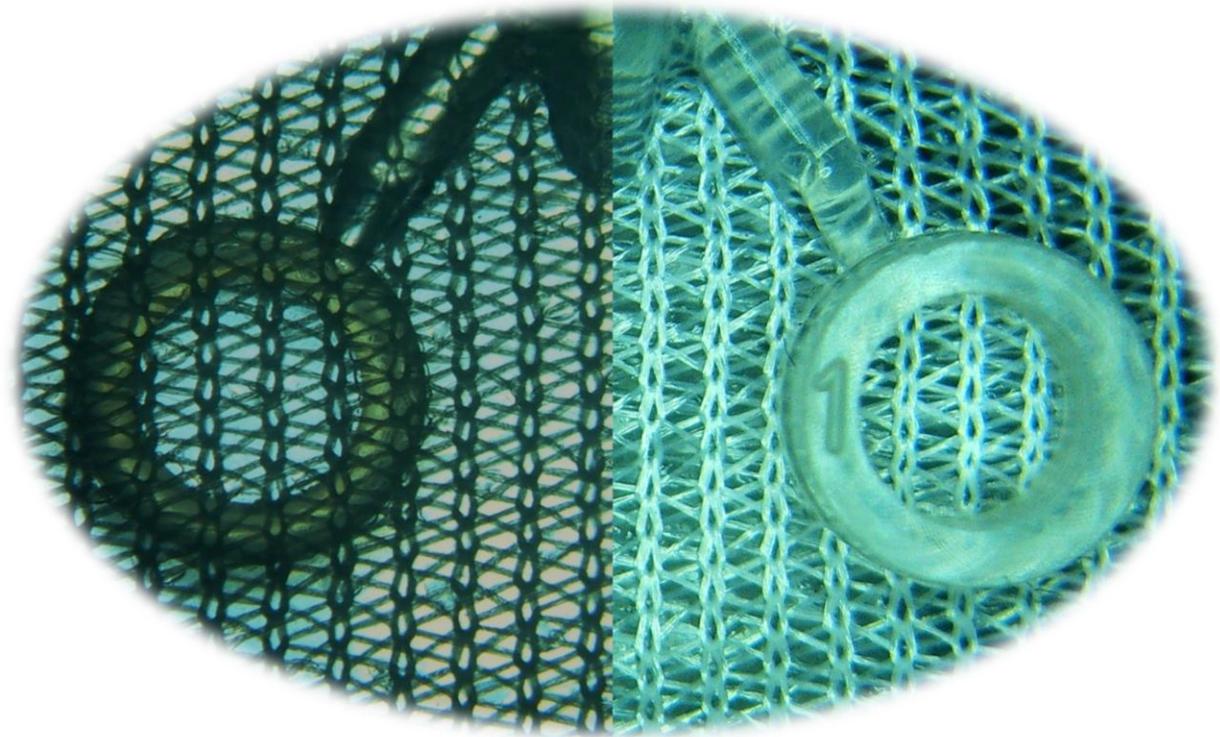
For this reason they were one of the first companies that brought our solution to their facilities. The picture below shows one of the components that is manufactured by USM in their production lines.



### III. IV Applications – Low Pressure

Some parts can be molded by **USM™** using **considerably lower filling pressure** values than other technologies. **That's specially valuable for overmolding applications where delicate inner cores or membranes cannot hold severe processing conditions.**

The pictures below show the filter of a swimming ear plug that prevents the water from getting into the ears. Even being the membrane extremely delicate, it was possible to overmold it without damage.



*One of the main challenges when dealing with micro over-molding applications is handling the tiny components and positioning them in the tool.*

*For this endeavour, the vertical configuration of Sonorus® equipment is ideal as it minimizes the automation requirements.*

*On the picture, a micro-filter composed by a metallic grid and a TPE frame.*

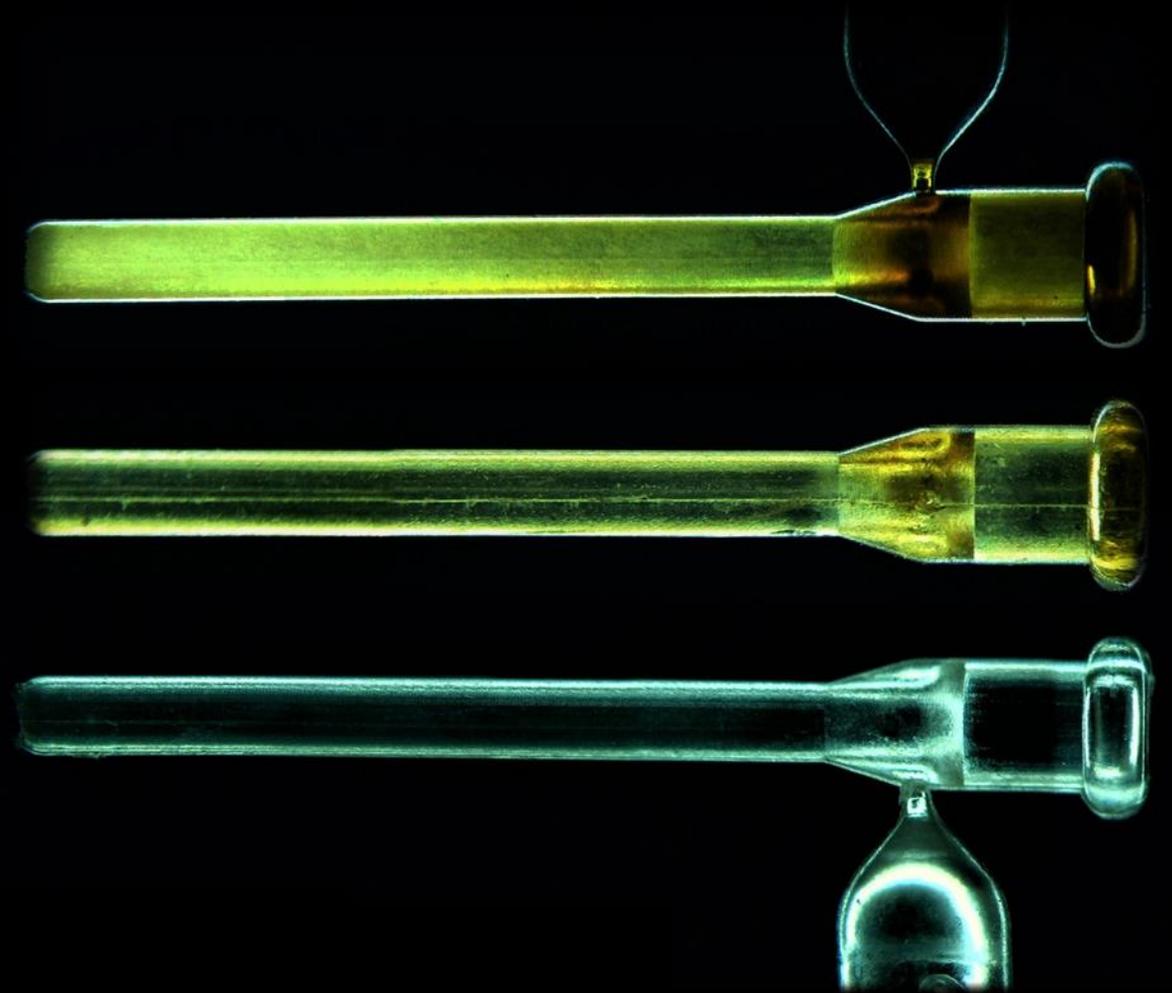


### III. IV Applications – Thin walls

*Some of the parts that we produce are very challenging due to the **combination of technical polymers (PEEK, PEI ...)** with **extremely thin wall thickness applications.***

*Cannula type parts are very common in the medical industry, the picture shows a **150 µm** wall thickness cannula molded with **PI, PEI and COC.***

*All molded with **very small gates,** something only possible thank to the enhanced flowability induced by the ultrasounds.*



Being **USM™** an **innovative and key enabling technology**, most of our projects are **protected by non-disclosure agreements with our customers**, reason why we cannot share information about our most challenging applications. If unsure about the suitability of **USM™** for your Project, please contact Ultrason's R&D department to get a personalized application feasibility analysis.

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[frivillas@ultrason.com](mailto:frivillas@ultrason.com)



*... Molding the impossible!*

*Thanks for your attention!*