

## PLASTICS INJECTION

In Aitiip technology center, we specialize in plastics processing technologies, both by injection since our inception as extrusion blow molding and extrusion compounding acquired more recently. To provide a complete service to our customers, we have a workshop equipped with plastics processing injection molding machines ranging from 85 to 3,000 tons of clamping force, and all the peripherals used in the transformation of plastics injection and all the necessary equipment for the manufacture of parts by the application of new technologies.



We are experts in conducting mold testing, as well as ENGINEERING PLASTICS, discipline can be grouped, for example the following lines:

- **Mold Testing Diagnostics**, where Aitiip technicians carry out the development of a mold with the advantage provided by having a machine shop in the center's facilities to make modifications or adjustments.
- **Design, development and manufacture of preproduction plastic parts with new technologies** that allow companies to learn about new trends in plastic injection and evaluate the feasibility of its implementation before making any investment.
- **Injection with new technologies**, such as injection of tissue-film, long fiber injection LFT-G, injection of supercritical fluids (MuCell ®), injection-compression, sequential fuel injection, etc.. Aitiip como Centro Tecnológico, dispone de las últimas y más innovadoras tecnologías existentes referidas a la transformación de plásticos por inyección.

## Supercritical Fluid Assisted Injection\_MuCell®

### Description and characteristics of the technology

MuCell® technology involves injecting a solution of **plastic with liquefied gas** so that once this solution is in the mold the gas vaporizes, leaving a porous plastic structure.

This vaporization leads to a gas bubble formation and operates as the 2nd pressure (maintenance phase) to expand the material and compacting it so it will not be necessary this phase of the injection machine.

The gases normally used are N2 and CO2.



### Main applications: General and specific

- **Information Technology and Communication market:** Internal structure of printers, copiers.
- **Automotive Sector:** reinforcement pillars, door panels, dashboards, grilles ...
- **Industrial, electrical and electronic sectors:** enclosures of switches, plastic screws, wired housings
- **Packing:** plastic packaging structures, pallets ..



## Technical Characteristics of the equipment

MuCell<sup>®</sup> technology, from the company Trexel Inc., requires special equipment, consisting of a special injection unit called MMU (MuCell Modular Upgrade) with a spindle and cylinder designed specifically for MuCell.



Aitiip Technology Centre

El centro tecnológico aitiip has installed the necessary equipment to perform the supercritical fluid-assisted injection in the Billion H6860CI molding machine (750T)

## Advantages

- **Reduction of melt viscosity** (mixing plastic + gas).
- **Reduction of clamping force** by reducing the required injection pressure.
- **Weight Reduction up to 30%.**
- **Cycle time reduction.**
- **Warpage and sink marks reduction.**
- Very good **dimensional stability** and repeatability
- **Minimization of burrs**
- **Maintenance of the stiffness** and strength of the component.
- **Shrinkage reduction** in the part

## Long Fiber Injection LFT-G

### Description and characteristics of the technology

Injection of long fiber material (LFT-G) involves the **injection of plastics loaded with long carbon or glass fibers** that will remain long after injection. Long fiber is understood when its length is above 10 mm.

For this type of injection it is required a very precise control of the plasticization (special screws) and injection molds with special sections and entries that will not break the fiber.



### Main applications (General and Specific)

The main applications for the injection of materials with long-fibers are:

1. Parts with **high** mechanical and / or thermal **requirements**.
2. Generally pieces **without aesthetic requirements** or subsequently painted or coated.

**Engine Cover – replacement of PA6 by PP+LGF**



**As a replacement for aluminum parts**



**As an alternative to laminated parts of glass fiber or epoxy resin**



## Technical characteristics of equipment

Transformation of LFT-G is compatible with the injection of water or gas in the nucleus. Compatible with sequential injection, compression and bi-material.

Clamping force	750 Ton.
Distance between columns	H 1100mm x V1100mm
Plates dimensions	Hp 1750mm x Vp 1570mm
Mold thickness range	Emin 450mm x Emax 1200mm.
Maximum opening stroke	1200mm.
Hydraulic Closure System	Hidraulic
Maximum Dose	4760 cm <sup>3</sup>



**BILLION 750 LTF-G**

## Advantages

- Ability to produce parts with **high mechanical properties**, both mechanically and thermally.
- **Reduction of clamp force** by reducing the required injection pressure
- Possibility to **replace materials** such as PA+30GF by PP +30LGF, thereby **reducing costs**.
- Possibility to manufacture **injection parts**, made by metal, laminated and so on, till now **without major geometric variations**.

## Gas Assisted Injection (GAM)

### Description and characteristics of the technology

It involves the injection of a gas into the plastic part simultaneously with the conventional injection process. The gas is introduced either at the end of the injection, during compaction or during the cooling of the part. This will get the gas to move the plastic still molten, leaving only the cold layer in contact with the mold. The piece will be "hollow" in areas where the gas moves the plastic.

The gas is injected through a needle into the vein melt. Plastic is moved out of the mold through an overflow pipe once the part filling is completed.

Once completed the plastic displacement, the gas itself acts as the compaction pressure, pushing the plastic against the mold walls and avoiding sink marks.

Note that depending on the pressure at which gas is introduced and how cold it is plastic in that time, the gas will spread only because of the thicker sections or throughout the piece. Once cool the part, the gas must leave the part without pressure being on the inside.



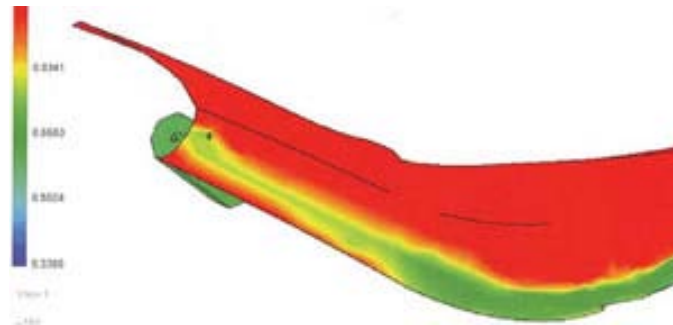
### Principales aplicaciones generales y específicas



- Plastic parts that are thick, such as handles, grips, etc..
- Plastic parts where the entire piece is thin with a thick cord, for example bags in door panels of cars, glove, boot door frame, etc..
- In general, parts with thick sections and / or mixed-thick fine.

## Advantages

- Ability to produce thick parts or thick sections without increasing time or sink marks.
- The gas used is N<sub>2</sub>, which does not cause degradation in the material.
- Dimensional stability, minimizing warpage.
- Improving the aesthetic quality, no sink marks, no warps, thick sections more pleasing to the touch.



## Injection over Textile

### Description and characteristics of the technology

The injection over textile or film consists of the injection onto a sheet of some special material (fabric, TPO, PUR, ...) so that the face-side of the piece remains with the aesthetic that has that film.

With the mold open, the sheet is placed in one of the sides. This sheet can be placed hot, conformed to the shape of the piece or as is.

The mold closes forming the sheet to the shape of the piece, after this, the plastic is injected which ends pushing the sheet against the mold while filling the rest of the piece.

### Main applications

The main applications for injection on films are pieces with high aesthetic and quality, such as car interiors.



### Advantages

- **Multitude of possibilities on aesthetics of the piece and manufacturing** like a standard piece of plastic (similar cycles).
- **Aesthetics type textile, fabric, Soft Touch (TPO), PUR sheets, wood-like finish**, and so on.
- **Possibility of using materials "not aesthetic"** because what you see of the part is not the part but the plastic film.
- **Not aesthetic materials:** High recycled content, Injection with supercritical fluids ...
- **Minimization of sink marks and rejects due to bursts, weld lines, flow marks**, etc...because they are covered by the film.

## Injection-Compression

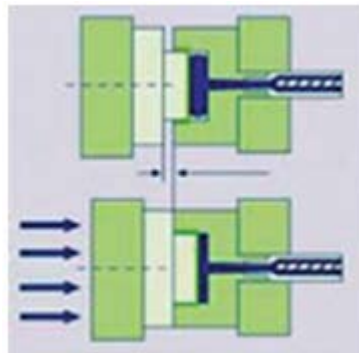
### Description and characteristics of the technology

The injection-compression involves **injecting with the mold partially open** and, either the end of the injection or simultaneously, closing the mold completely so that clamping force is itself responsible of the filling of the mold cavity by the injected material

### Main applications

The main applications for injection compression are:

1. Molded parts over any sheet (textile, TPO, PUR, ...) because the shear to which they are subjected by the plastic is great if  $P_{inj}$  is high and can break or move the corresponding sheet.
2. Any piece which a flow path ratio/sections small.



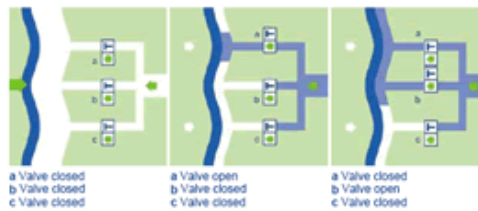
### Advantages

- **Reduced injection pressure**, higher flow paths.
- **Drastic reduction of residual stresses and deformations**
- **Possibility to inject on textile, films, TPO or similar**, all materials that may be damaged or moved by the shear of the material if it is high (high pressure).

## Sequential Injection

### Description and characteristics of the technology

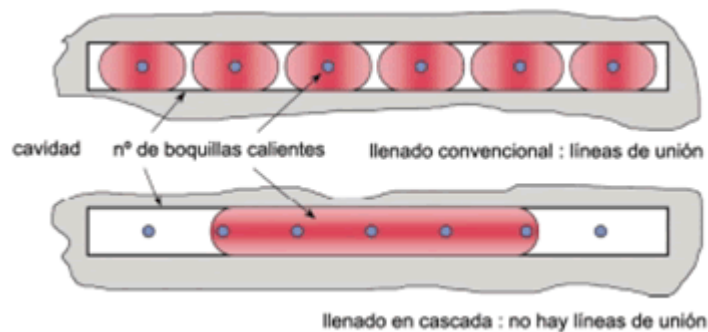
This process consists of control the opening and closing of each of the different inputs to have a piece as appropriate to it.



Process diagram

If a part with six injection points the plastic comes in simultaneously by the six, at some point flow fronts come together creating a weld lines.

If instead of this, we make the plastic to enter to the main entrance of the part and when the front flow slightly exceeds the following entries we open these, the plastic will flow continuing the existing flow. This way you can delete unwanted weld lines.



Filling simulation

The good thing about this technology is that a part can be manufactured without welding lines and using a low pressure on a simple way.

So far, in order to avoid weld lines all we could do was injecting through a single point of entry, this could cause very high injection pressures if the flow path ratio / thickness was large.

With sequential injection we can eliminate lines maintaining a low injection pressure because the piece is filled through several entrances.

## Main applications

Its main areas of application are automotive, transportation, appliances, kitchenware, telephone and computers.

Aesthetic pieces in which you want to eliminate weld lines.

## Advantages

- Elimination of weld lines while maintaining a high number of injection points per part and therefore low injection pressure.
- Increase strength by eliminating weld lines that are weakening the part.
- Elimination of air traps in these welds.