



*Thermoforming*





Over 45 years' presence in the international markets and 1.300+ plants installed all over the world, make COMI the supplier reference point for the thermoforming machines employed in the manufacturing of refrigerators inner liners and doors, both in the design and in the production capacity. Design and development with the most advanced 3D software, structural check with the finished elements parts analysis (FEM), process engineering consultancy, components of the best quality and certified, technical service are the strengths upon which COMI has built its leadership.

The LaborForma single-station thermoforming machines are instead designed for Automotive, Sanitary and Industrial applications.

All COMI thermoforming machines can be equipped with optionals which increase productivity and efficiency, or provided by all mechanical cutting and drilling systems and/or Laser. Through its division TechMill, COMI can finally provide CNC Milling as well as WaterJet or Laser Cutting machine for finishing the pieces.

在国际市场上超过45年的发展历史，1300+台套设备在全球的安装使用，让COMI在用于冰箱内胆和门衬制造的热成型机领域，成长为里程碑式的企业，无论是设计还是制造。

通过先进的3D软件进行的设计开发、经由有限元方法（FEM）的结构分析、过程工程管理、最佳质量元器件的采用以及经过检验的优质技术服务，造就了COMI在市场上的领导者地位。

所有的COMI成型机可配置提高生产效率和节拍的选配项，比如机械式切割和打孔系统和/或激光系统。通过TechMill事业部的支持，COMI既可提供CNC加工中心也可以提供水切割机或激光切割机对工件进行最后的精整加工。

# Selection criteria 选择条件

|   |   |   |  | HIPS - ABS | PMMA - PP | PVC | REFRIGERATORS<br>冰箱 | APPLIANCES<br>电器 | AUTOMOTIVE<br>汽车 | SANITARY<br>卫浴 | INDUSTRIAL<br>工业 |   |
|---|--|--|---|------------|-----------|-----|---------------------|------------------|------------------|----------------|------------------|---|
| <b>In line Thermoforming<br/>Basic/SuperLine<br/>Vacuum Forming</b><br>连线热成型机   | <br>0,5÷8 mm<br>0,02÷0,31 inch  | <br>BasicLine<br>----<br><br>SuperLine     | Vacuum in the mould<br>模具内真空成型  | ✓          | ✓         |     | ✓                   | ✓                | ✓                | ✓              |                  |    |
| <b>In line Thermoforming<br/>Basic/SuperLine<br/>New Generation</b><br>连线热成型机   | <br>0,5÷8 mm<br>0,02÷0,31 inch  | <br>BasicLine<br>----<br><br>SuperLine     | Vacuum + "in bell" ballooning<br>真空+钟箱内起泡   | ✓          | ✓         |     | ✓                   | ✓                | ✓                | ✓              |                  |    |
| <b>In line Thermoforming<br/>Basic/SuperLine<br/>Pressure Forming</b><br>连线热成型机 | <br>0,5÷8 mm<br>0,02÷0,31 inch   | <br>BasicLine<br>----<br><br>SuperLine  | Vacuum + "in bell" ballooning<br>真空+钟箱内起泡   | ✓          | ✓         |     | ✓                   | ✓                | ✓                | ✓              |                  |   |
| <b>In line Thermoforming<br/>HEDL<br/>Pressure Forming</b><br>连线热成型机            | <br>0,5÷2,5 mm<br>0,02÷0,10 inch<br> | <br>BasicLine<br>----<br><br>SuperLine | Vacuum + ballooning + pressure<br>真空+起泡+压空  | ✓          | ✓         |     | ✓                   | ✓                | ✓                |                |                  |  |
| <b>Single-station<br/>Thermoforming<br/>Laborforma</b><br>单工位热成型机               | <br>4÷12 mm<br>0,15÷0,47 inch<br>    | <br>1   | Vacuum in the mould<br>模具内真空成型  | ✓          | ✓         | ✓   | ✓                   | ✓                | ✓                | ✓              | ✓                |  |
| <b>Thermoforming<br/>Moulds</b><br>成型模具   | Single or Double side<br>单开门或双开门   | Side by Side<br>对开门<br>Refrigerators<br>冰箱   | Positive or Negative<br>阳模或阴模<br>Refrigerators<br>冰箱                              | ✓          | ✓         | ✓   | ✓                   | ✓                | ✓                | ✓              | ✓                |  |
| <b>Cutting &amp; Punching<br/>systems</b><br>剪切和冲孔系统                            | Double/<br>single blade<br>guillotins<br>双刀或单刀切边装置   | Laser<br>激光<br>---<br>CNC centres<br>数控中心  | Punching<br>Presses<br>& Molds<br>冲孔压力机&模具  | ✓          | ✓         | ✓   | ✓                   | ✓                | ✓                | ✓              | ✓                |  |

✓ Best application / 最佳应用    ✓ Suggested application / 建议应用



## Applications & Technologies

## 应用&技术

### TECHNOLOGIES WHICH ADD VALUE

- Energy consumption optimization through the balancing of heaters temperature and pressure use
- Reduction of materials waste thanks to maximum surface used
- OEM and maintenance cost reduction thanks to venturi, active only during ballooning time, installed in substitution of some vacuum pump.
- Guarantee of high productivity thanks to machine engineering

### 技术增值

- 通过加热器温度和压空使用的平衡来实现能源消耗最优化
- 最大限度的表面使用减少材料浪费
- 通过基于文丘里原理的VGS系统的应用，取代部分真空泵仅在需要时比如吸泡过程激活，可降低生产和维护成本
- 工程技术的采用保证了机器极高的生产能力



# Machine configuration 设备配置

## Heating elements / 加热瓦



Ceramic / 陶瓷



Quartz / 石英



Flash Black



Automatic adaptive frame  
自动适配框架



Cooling system  
冷却系统



Automatic mold change  
自动换模



## BasicLine/SuperLine 基本型/超级型

### LOADING

- Sheet

### HEATING

- One station in BasicLine, two for SuperLine
- IR ceramic or quartz heating elements

### FORMING

- Vacuum in the mould
- Positive moulds

### CUTTING

- Perimetral cut by guillotine or presse

## Vacuum Forming 真空成型

### 上料

- 板材

### 加热

- 基本型是单加热工位，超级型是双加热工位
- 红外辐射陶瓷加热器或 石英加热器

### 成型

- 模内真空成型
- 阳模

### 切边

- 切割机或者压力机进行四周切边



| Materials - 材料          | Thickness - 厚度              |
|-------------------------|-----------------------------|
| HIPS / ABS, sheets - 板材 | up to / 可达 8 mm - 0,31 inch |
| Dimensions - 尺寸         |                             |
| 2.000 x 900 x 600* mm   | 78,7 x 35,4 x 23,6* inch    |
| 2.100 x 1.250 x 600* mm | 82,6 x 49,2 x 23,6* inch    |
| 2.200 x 900 x 600* mm   | 86,6 x 35,4 x 23,6* inch    |
| 2.000 x 1.000 x 600* mm | 78,7 x 39,3 x 23,6* inch    |
| 2.200 x 1.000 x 600* mm | 86,6 x 39,3 x 23,6* inch    |

\* Depth of the moulded pieces available up to 800 mm - 31,5 inch  
\* 成型件成型深度最大可达800mm-31.5 inch

| Productivity - 生产力 |                     |  |
|--------------------|---------------------|--|
| Inner liners - 内胆  |                     |  |
| HIPS               | 4 mm - 0,157 inch   | Up to - 可达 100 p/h                             |
| ABS                | 3,1 mm - 0,122 inch | Up to - 可达 100 p/h (BL) Up to - 可达 80 p/h (SL) |
| Inner doors - 门衬   |                     |  |
| HIPS               | 1,5 mm - 0,069 inch | Up to - 可达 220 p/h                             |
| ABS                | 1,4 mm - 0,055 inch | Up to - 可达 220 p/h                             |

Productivity achievable in production with molds supplied by COMI  
使用COMI提供的模具可确保生产能力

also for  
亦可用于  
真空成型: SIDE by SIDE



## BasicLine/SuperLine 基本型/超级型

### FORMING

- Forming by vacuum in the mould and ballooning through a bell located in the upper part of the heating station
- Bell capable to work with positive molds with 2 similar or different shapes (Side-by-Side)
- Cooling system to quickly cool down the thermoformed part
- Positive or negative moulds

### CUTTING

- Perimetral cut by guillotine or presse

## New Generation 新一代

### 成型

- 成型过程通过模具内真空实现，材料起泡是通过一套安装在成型站上部的“钟箱”执行
- 钟箱可适用于2种相似形状或者不同形状（对开门）的阳模
- 冷却系统用于成型件的快速冷却
- 阳模或阴模

### 切边

- 切割机或者压力机进行四周切边



| Materials - 材料          | Thickness - 厚度              |
|-------------------------|-----------------------------|
| HIPS / ABS, sheets - 板材 | up to / 可达 8 mm - 0,31 inch |
| Dimensions - 尺寸         |                             |
| 2.000 x 900 x 600* mm   | 78,7 x 35,4 x 23,6* inch    |
| 2.100 x 1.250 x 600* mm | 82,6 x 49,2 x 23,6* inch    |
| 2.200 x 900 x 600* mm   | 86,6 x 35,4 x 23,6* inch    |
| 2.000 x 1.000 x 600* mm | 78,7 x 39,3 x 23,6* inch    |
| 2.200 x 1.000 x 600* mm | 86,6 x 39,3 x 23,6* inch    |

| Productivity - 生产力 |                     |   |
|--------------------|---------------------|---|
| Inner liners - 内胆  |                     |   |
| HIPS               | 4 mm - 0,157 inch   | Up to - 可达 110 p/h (65-85 p/h side-by-side)       |
| ABS                | 3,1 mm - 0,122 inch | Up to - 可达 110 p/h (65-85 p/h side-by-side)       |
| Inner doors - 门衬   |                     |   |
| HIPS               | 1,5 mm - 0,069 inch | Up to - 可达 300 p/h (SL) - Up to - 可达 250 p/h (BL) |
| ABS                | 1,4 mm - 0,055 inch | Up to - 可达 300 p/h (SL) - Up to - 可达 250 p/h (BL) |

\* Depth of the moulded pieces available up to 800 mm - 31,5 inch  
\* 成型件成型深度最大可达800mm-31.5 inch

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also for  
亦可用于  
真空成型: SIDE by SIDE

## BasicLine/SuperLine 基本型/超级型

### FORMING

- Forming by vacuum in the mould and ballooning through a bell located in the upper part of the heating station
- Bell capable to work with positive molds with 2 similar or different shapes (Side-by-Side)
- Compressed air at 2/4 bar inside the bell, to support vacuum
- Cooling System to quickly cool down the thermoformed part
- Positive or negative moulds

### CUTTING

- Perimetral cut by guillotine or presse

## Pressure Forming 压空成型

### 成型

- 成型过程通过模具内真空实现，材料起泡阶段通过一套安装在成型站上部的“钟箱”执行
- 钟箱可进行2种相似形状或者不同形状（对开门）的阳模
- 钟箱内部压空成型，压缩空气2/4bar
- 冷却系统用于成型件的快速冷却
- 阳模或阴模

### 切边

- 切割机或者压力机进行四周切边



| Materials - 材料          | Thickness - 厚度              |
|-------------------------|-----------------------------|
| HIPS / ABS, sheets - 板材 | up to / 可达 8 mm - 0,31 inch |
| Dimensions - 尺寸         |                             |
| 2.000 x 900 x 600* mm   | 78,7 x 35,4 x 23,6* inch    |
| 2.100 x 1.250 x 600* mm | 82,6 x 49,2 x 23,6* inch    |
| 2.200 x 900 x 600* mm   | 86,6 x 35,4 x 23,6* inch    |
| 2.000 x 1.000 x 600* mm | 78,7 x 39,3 x 23,6* inch    |
| 2.200 x 1.000 x 600* mm | 86,6 x 39,3 x 23,6* inch    |

\* Depth of the moulded pieces available up to 800 mm - 31,5 inch  
\* 成型件成型深度最大可达800mm-31.5 inch

| Productivity - 生产力 |                     |   |
|--------------------|---------------------|---|
| Inner liners - 内胆  |                     |   |
| HIPS               | 3,8 mm - 0,149 inch | Up to - 可达 180 p/h (85-110 p/h side-by-side)      |
| ABS                | 3,0 mm - 0,118 inch | Up to - 可达 180 p/h (85-110 p/h side-by-side)      |
| Inner doors - 门衬   |                     |   |
| HIPS               | 1,5 mm - 0,069 inch | Up to - 可达 300 p/h (SL) - Up to - 可达 250 p/h (BL) |
| ABS                | 1,4 mm - 0,055 inch | Up to - 可达 300 p/h (SL) - Up to - 可达 250 p/h (BL) |

Productivity achievable in production with moulds supplied by COMI  
使用COMI提供的模具可确保生产能力



also for  
亦可用于 真空成型: SIDE by SIDE



## HEDL

### LOADING

- from reel to reach a very high productivity, or sheet

### HEATING

- single top panel at 3 steps (reel) or 2 sandwich panels (Sheet)
- IR ceramic, quartz, or flash black heating elements

### FORMING

- Forming by vacuum in the mould, with ballooning through a bell integrated in the mold
- Compressed air at 2/5 bar inside the bell, to support vacuum
- positive or negative moulds

### CUTTING

- perimetral cut by guillotine or punching presse
- chip cutting system at exit station



## Pressure Forming 压空成型

### 上料

- 从卷材或者板材开始 达到高生产能力

### 加热

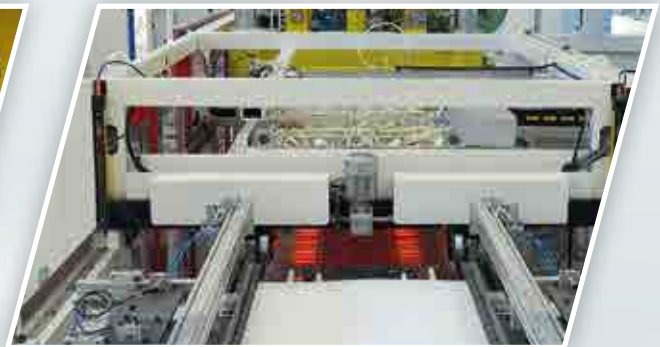
- 三段式上部单加热盘 [卷料], 或三明治式双加热盘 [板料]
- 红外辐射陶瓷 石英或者 FlashBlack加热器

### 成型

- 模具内真空成型, 起泡阶段是通过集成在模具内的“钟箱”执行
- 钟箱内部压空成型, 压缩空气2/5bar
- 阴模或者阳模

### 切边

- 切割机或者压力机进行四周切边
- 出口处的废料切断系统



| Materials - 材料             | Thickness - 厚度               |
|----------------------------|------------------------------|
| HIPS / ABS, reel or sheets | up to / 可达 2 mm - 0,078 inch |

| Dimensions - 尺寸         |                         |
|-------------------------|-------------------------|
| 2.000 x 900 x 200* mm   | 78,7 x 35,4 x 7,8* inch |
| 2.200 x 1.000 x 200* mm | 86,6 x 39,3 x 7,8* inch |

| HEDL                    |                     |                    |
|-------------------------|---------------------|--------------------|
| Inner doors, from sheet |                     |                    |
| HIPS                    | 9,0 mm - 0,354 inch | Up to - 可达 320 p/h |
| ABS                     | 9,0 mm - 0,354 inch | Up to - 可达 320 p/h |



## Guillotines

Single or double blade cutting stations specifically designed to be integrated in the thermoforming plant for the execution of the liners and doors contouring. Different configurations make possible to meet the plant and productivity requirements.

## 切割机

单刀或双刀切割机经特殊设计集成在成型设备上执行内胆和门衬的剪切操作。不同的配置可满足设备和生产节拍要求





## Punching presses

Presses for the drilling or cutting of the thermoformed inner cells and doors have been realized to be put in line with the thermoforming machines.

Presses with different closing planes force have been studied to embrace various solutions: 30, 60, 100, 150 and 200 tons.

They can be equipped in order to meet different requirements. There are also versions of presses that can be in a detached position, with the option of an automatic loading and unloading.

## 冲压机

冲压机用于成型后内胆和门衬的冲孔，并实现与成型机连线布置

压机锁模力按照不同的要求开发设计，从30吨，60吨，100吨，150吨到200吨。

可以按照不同的要求开发设计

还可以采用独立压机，可选自动上料和卸载功能。





## Punching Moulds

To complete the production cycle, COMI provides punching moulds for the piece finishing.

The strong experience in the refrigerator sector enabled to develop the best technical solution according to the different production needs, among which:

- Inner liners with corner cutting moulds
- Separated inner liners punching moulds
- Inner doors cutting moulds

## 冲压模具

为完成生产循环，COMI也可以提供冲压模具用于工件的最后加工

在冰箱行业丰富的经验使得我们可以根据不同的生产需求提供最佳的技术解决方案。

- 带切角功能的内胆冲压模具
- 带分离切断的内胆冲孔模具
- 门衬切边模具





## Thermoforming Moulds

Thanks to a long-standing experience gained in 40 years of activity, COMI designs and manufactures specific thermoforming moulds for the appliances industry, among which:

- Double cavity inner liner moulds
- Side by side inner liner moulds
- Negative inner liner moulds

The high-quality of this thermoforming moulds, which allows an optimized material distribution and a better definition of the finished product, is then completed by the COMI technical service that support the customer from test to the final production start-up.

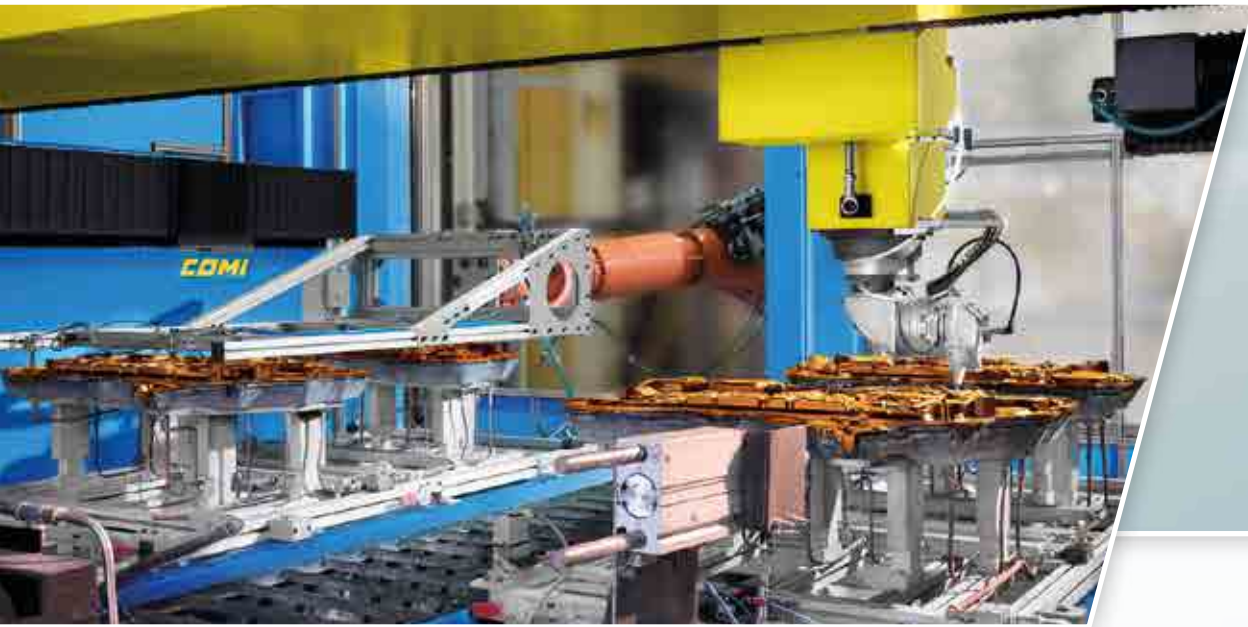
## 成型模具

凭藉40多年的长期经验，COMI可以为家电工厂设计和制造特定的成型模具：

- 双腔内胆模具
- 对开门内胆模具
- 阴模内胆模具

这些高质量的成型模具可以实现优化的材料分布和更好的成品定义，从客户测试到最终的生产启动由COMI提供技术服务支持。





## Laser Cutting systems

To perform cutting of complex shapes where is requested very high precision and speed, COMI manufactures cutting systems performed by laser technology.

High quality laser sources, robot and/or extremely precise mechanical components are engineered to design innovative, three-dimensional as well as bi-dimensional, laser cutting machines for thermoformed parts.

## 激光切割系统

为了完成复杂形状的切割所需要的高精度和高速度，COMI设计制造激光切割系统。

高质量的激光源、机器人和/或极其精密的机械部件被应用于设计创新的、三维的、双维的、用于热成型部件的激光切割设备。





## CNC Working Centers

Among the TechMill CNC working centers range, two are the models particularly suitable to trim thermoformed parts.

**LaborMix** is a 5 axis working center specifically designed for the machining of plastic materials, able to achieve very high productivity results and quality in trimming operations.

Equipped with working head with spindle at two opposite exits or four independent spindle head, it is the best solution for three-dimensional trimming of thermoformed parts.

**LaborMax** is an extremely versatile working center capable to satisfy the milling requirements on a wide variety of materials, with characteristics which made it the best solution for composite materials working operations.

Available in several standard dimensions and versions, with fixed, rotary (pallet changer) or extractable tables, with different power working head, with linear or rotary tool magazines.

## 数控加工中心

有 2 种型号的数控加工中心特别适用于修剪热成型件  
LaborMi 是专门设计用于塑料加工设备的 5 轴加工中心，  
可达到非常高的生产效率和质量  
配备双主轴或四个独立主轴的工作头，是修整热成型件的  
最佳解决方案

LaborMax 是用途广泛的加工中心，能够满足各种材料的  
铣削要求，其特点使其成为加工复合材料的最佳解决方  
案。可在几个标准尺寸和版本中使用，有固定的、旋转的  
(托盘更换器) 或可移出的台面，有不同功率的工作头，  
使用直线型或旋转型刀库。





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