



**BRIEF**



**DRAFT**

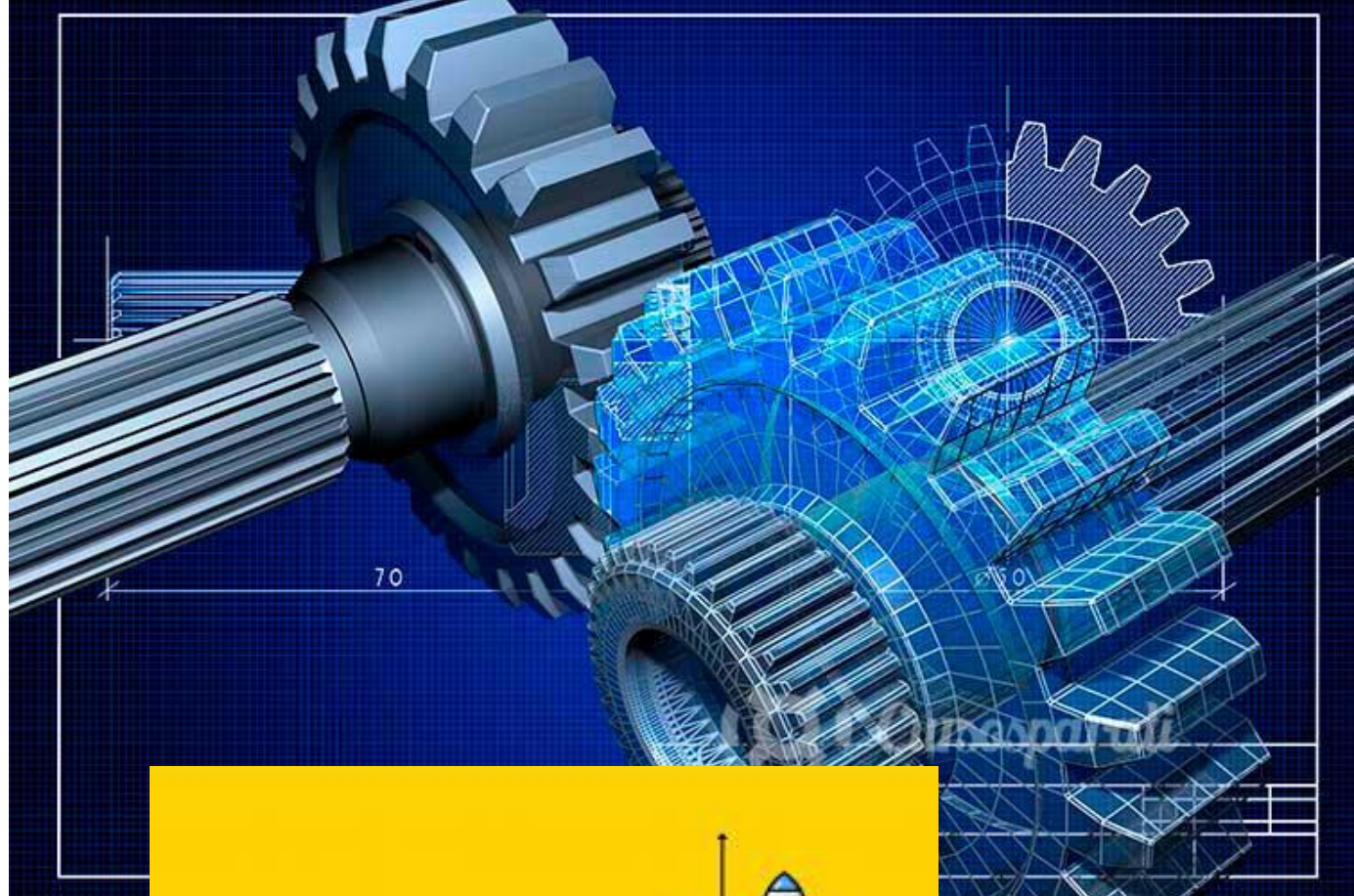


**DESIGN**



**DELIVER**

MERC  Digital



# El proceso de diseño

# Introducción

1900

1940

2012

2050?

Cameras



Phones



Toilets





# Introducción

1900

1940

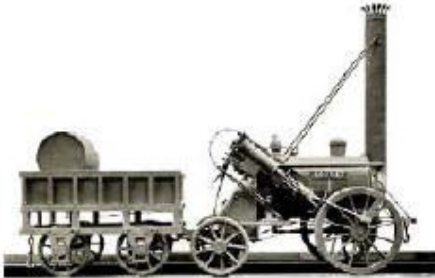
2012

2050?

Bikes



Trains

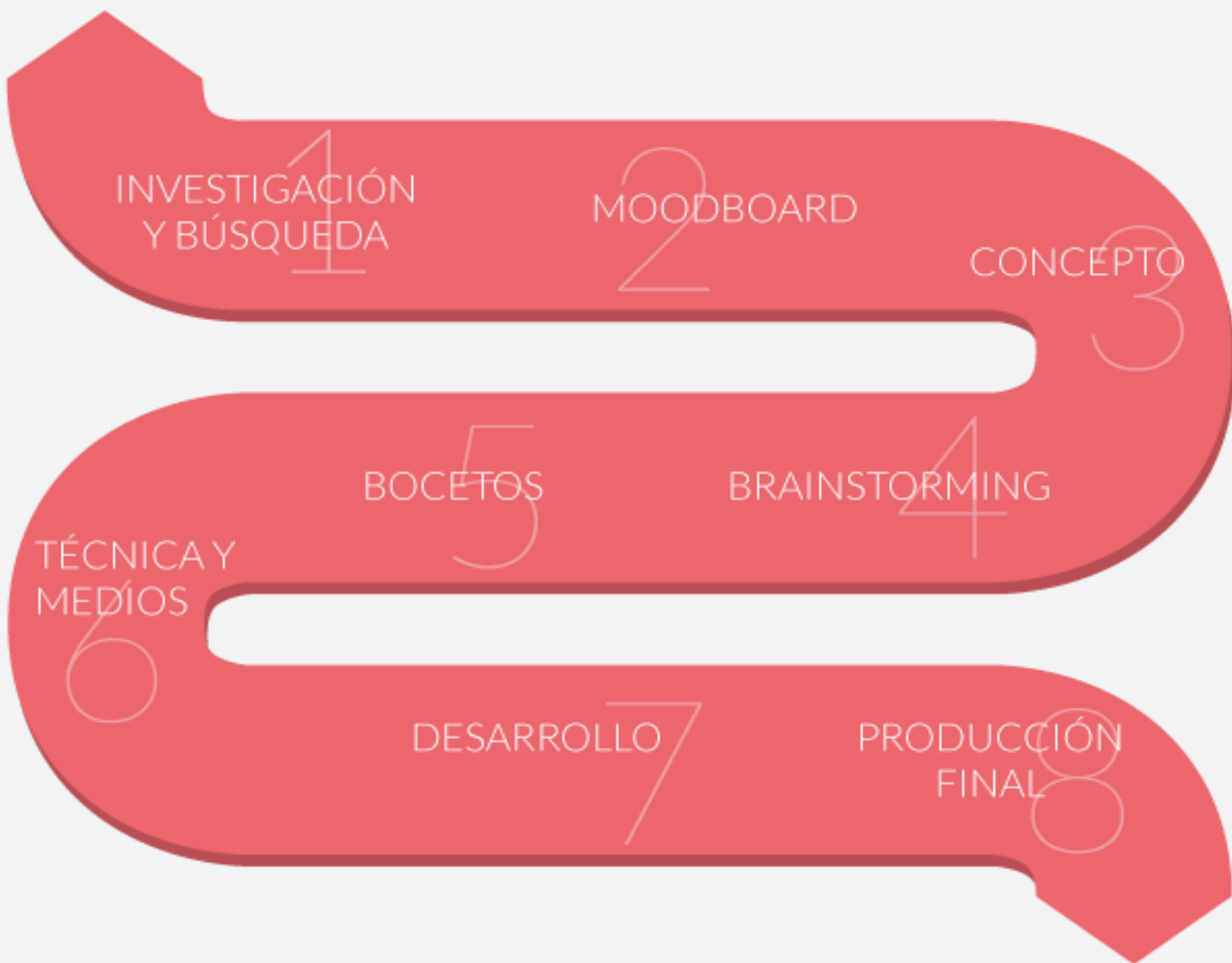


Planes



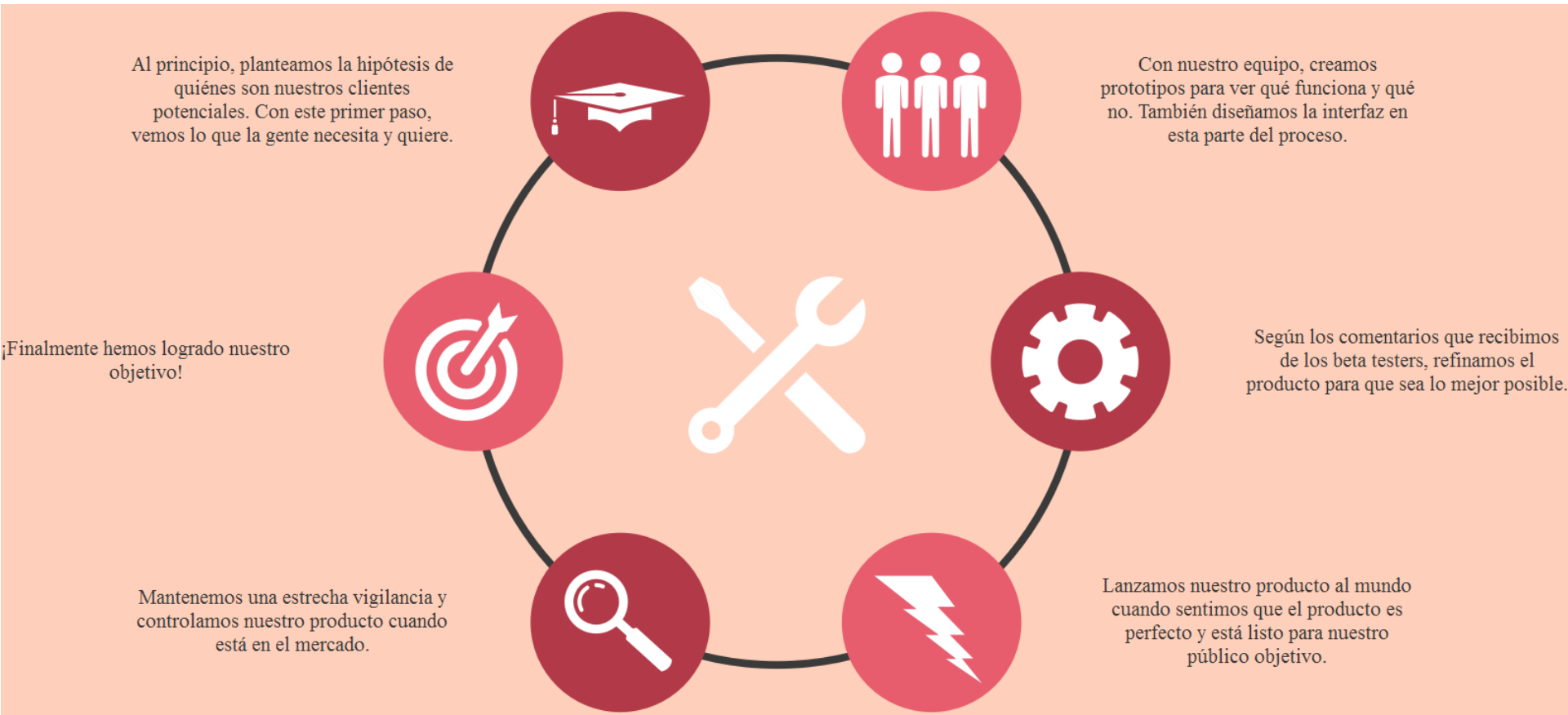
# Introducción

BRIEFING

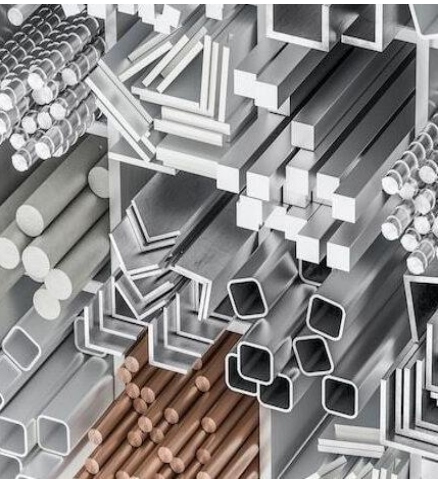


ENTREGA FINAL

# Introducción

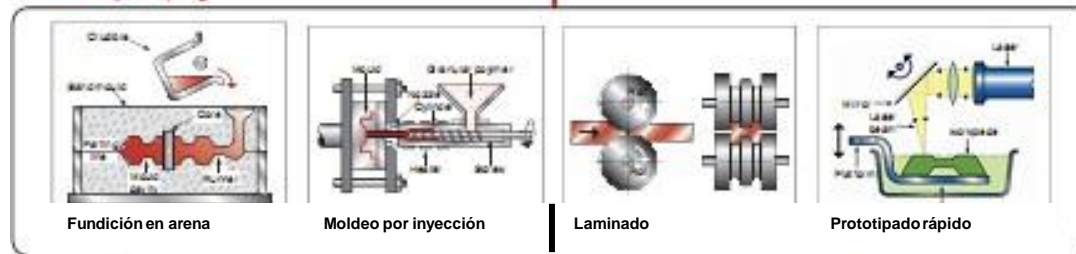


# Tipos de materiales

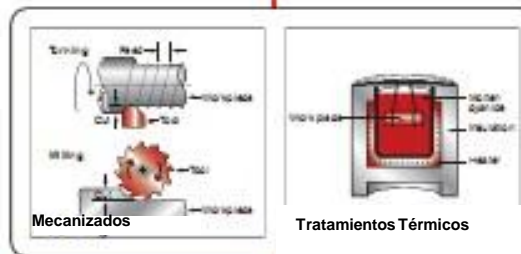


## Procesos primarios

## Materias primas

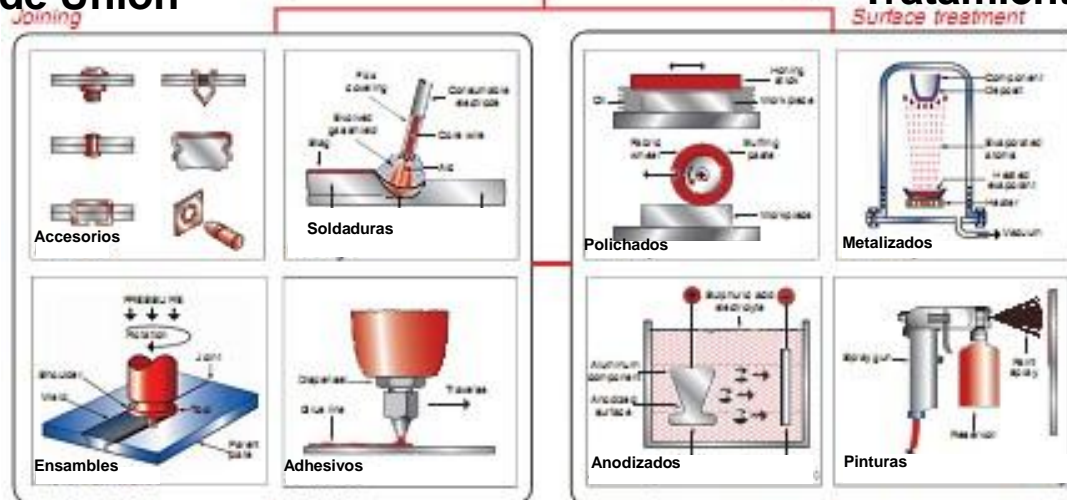


## Procesos secundarios



## Procesos de Unión

## Tratamientos superficiales



## Producto terminado



# Metodología de Diseño Industrial







# Problema de Diseño

# Concepto de Diseño

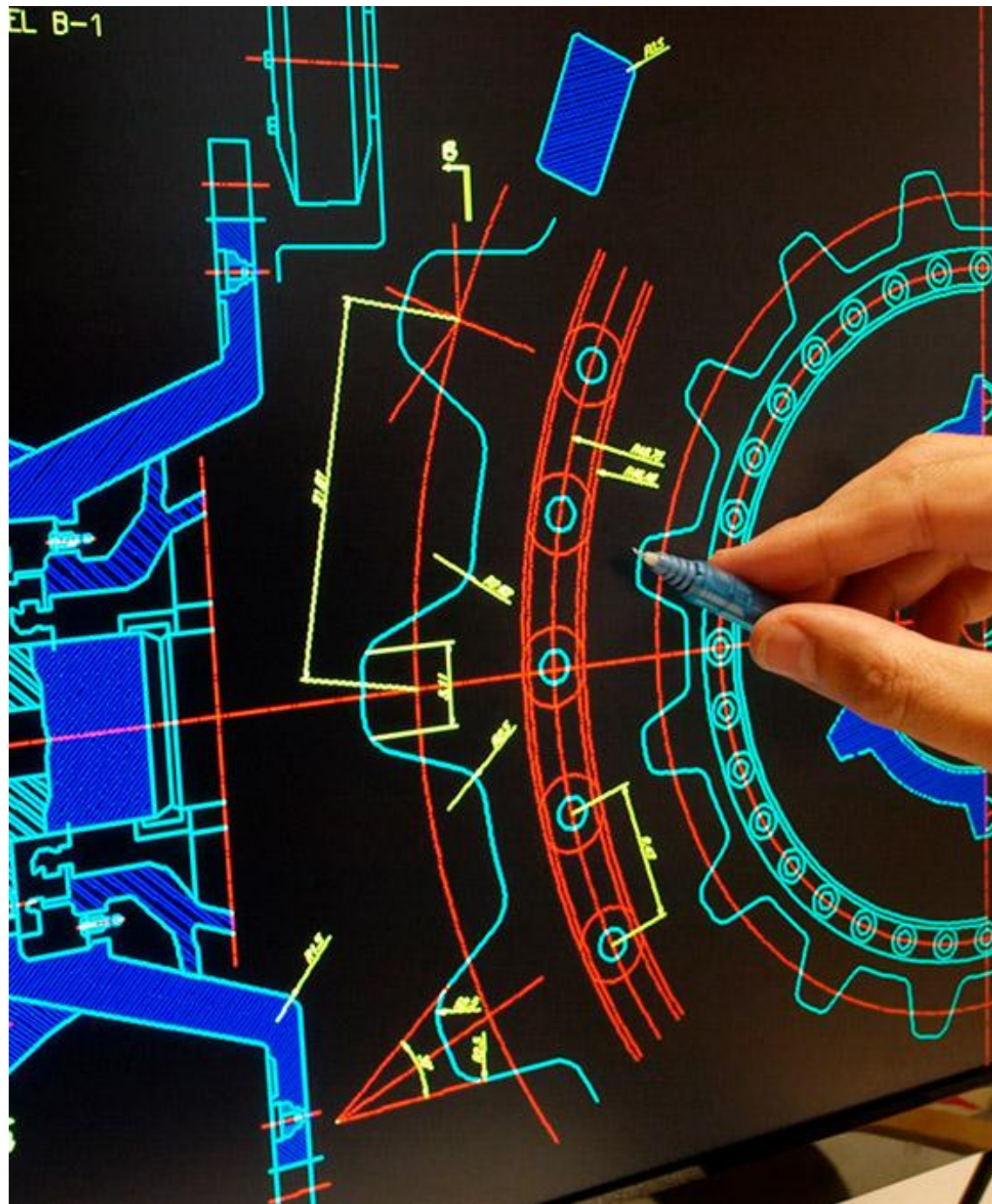




# Configuración del Producto



# Diseño detallado

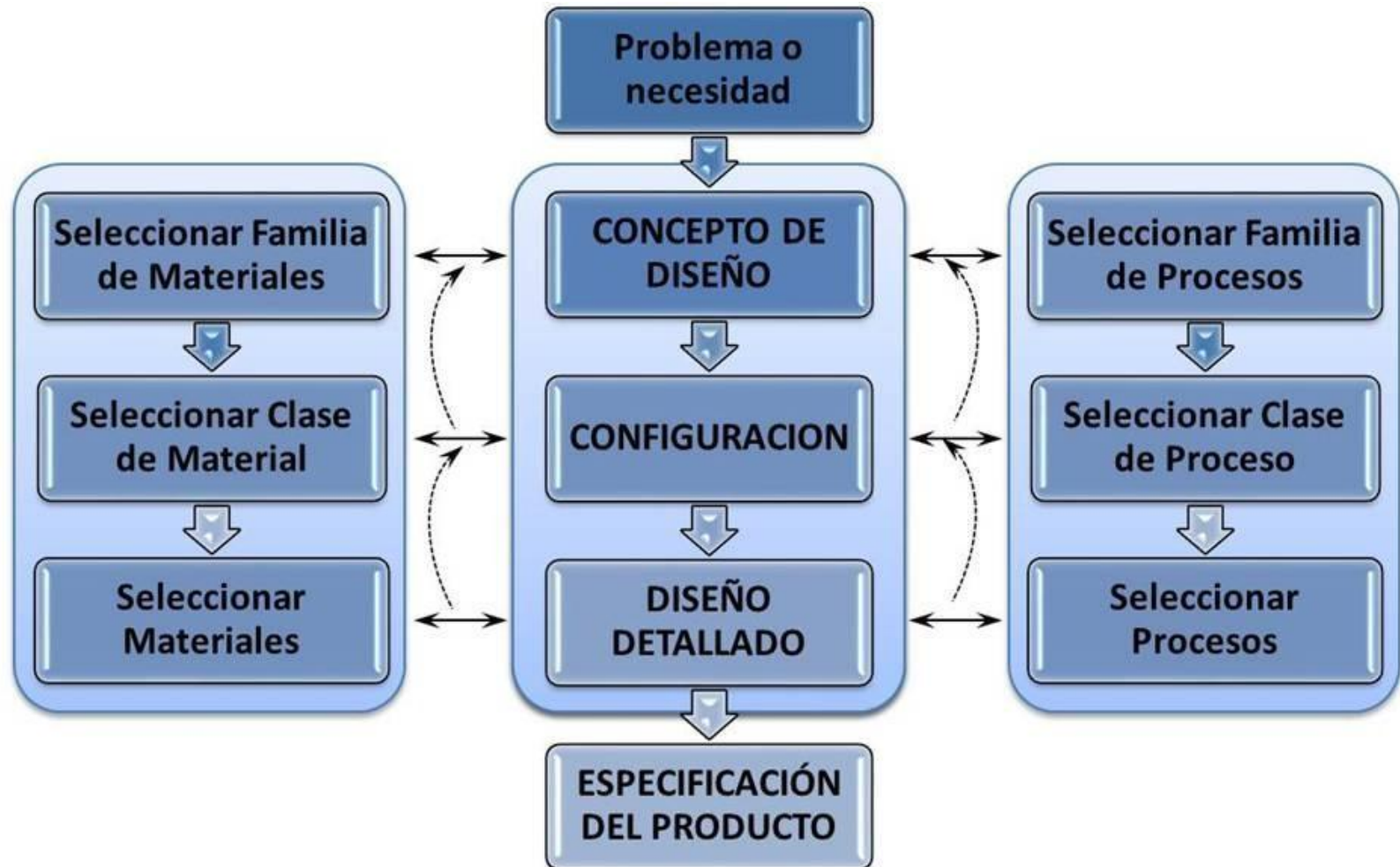






**Producto terminado**

# Metodología con selección de Materiales y Procesos



# Taxonomía de Clasificación de Materiales



# Taxonomía de Clasificación de Procesos

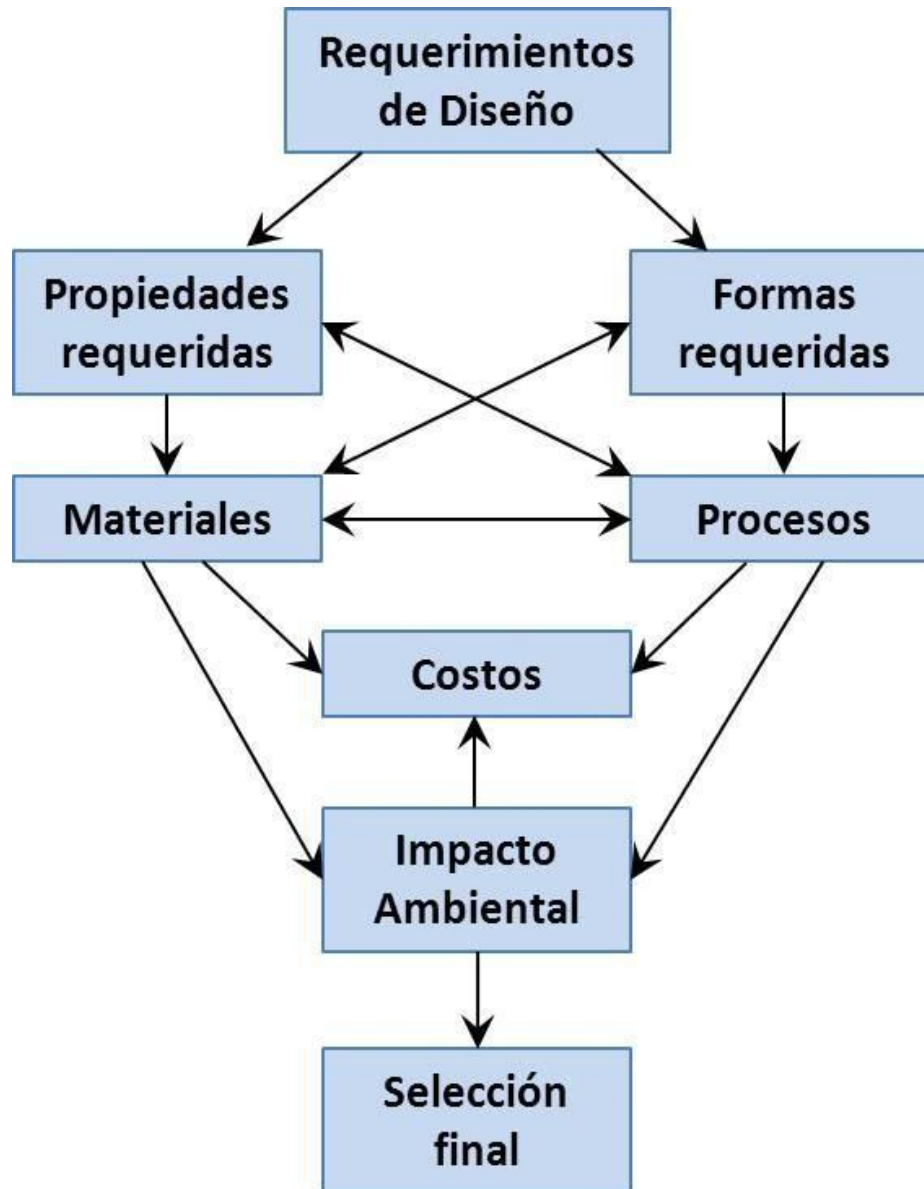




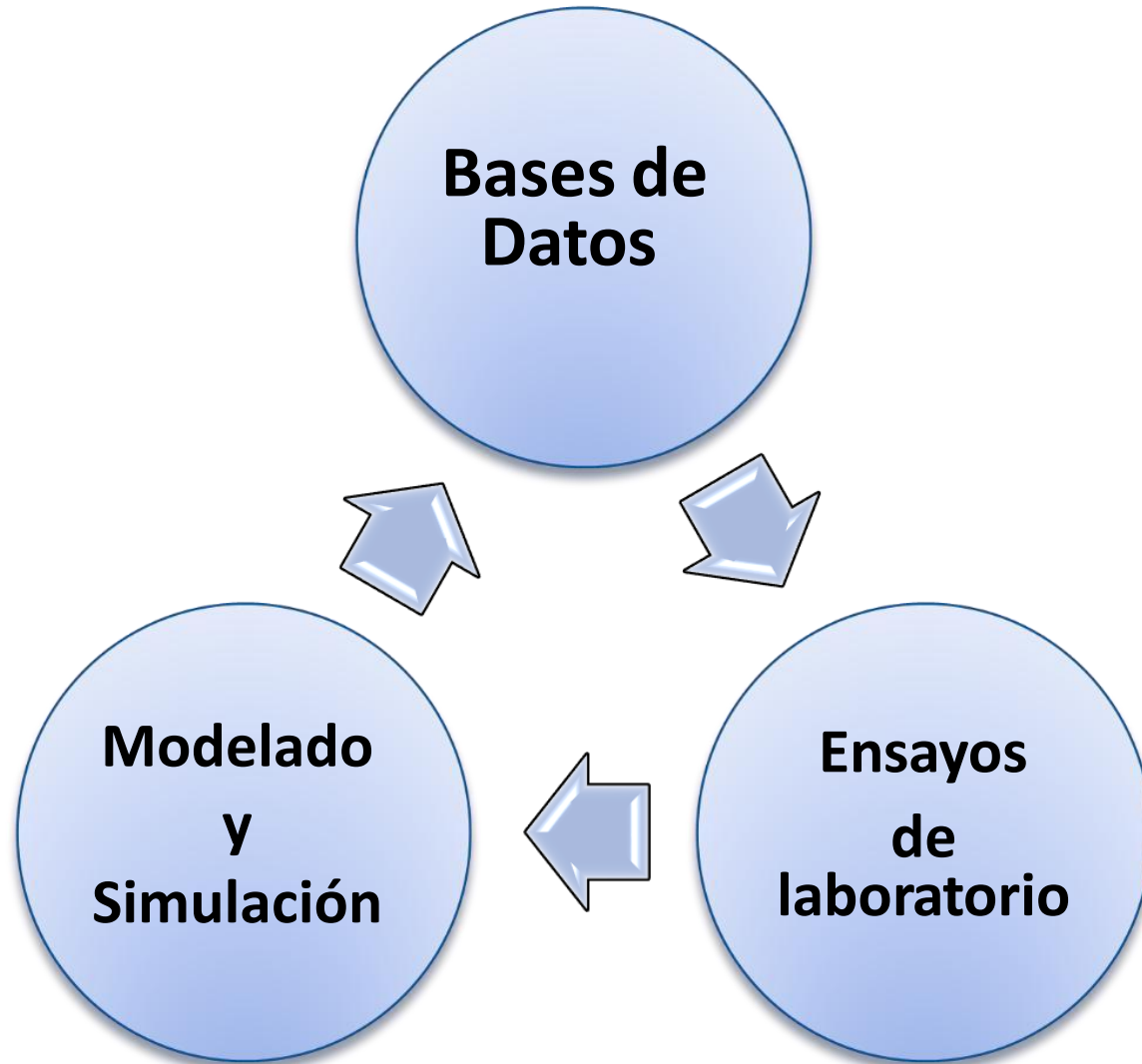
# Estrategia de Selección



# Factores que intervienen



# Herramientas para análisis y selección



# Bases de datos

## ● Mat Web. com



### Material Category Search

Find a Material Category:

Type at least 4 characters here...

Select a Material Category:

- ☒ Carbon (793 matls)
- ☒ Ceramic (8496 matls)
- ☒ Fluid (6146 matls)
- ☒ Metal (15261 matls)
- ☒ Other Engineering Material (6046 matls)
- ☒ Polymer (84189 matls)
- ☒ Pure Element (479 matls)
- ☒ Wood and Natural Products (389 matls)

Selected Material Category:

none

FIND

RESET

| Physical Properties | Metric    | English                   |
|---------------------|-----------|---------------------------|
| Density             | 2.70 g/cc | 0.0975 lb/in <sup>3</sup> |

| Mechanical Properties      | Metric                           | English                          |
|----------------------------|----------------------------------|----------------------------------|
| Hardness, Brinell          | 30                               | 30                               |
| Tensile Strength, Ultimate | 124 MPa                          | 18000 psi                        |
| Tensile Strength, Yield    | 55.2 MPa                         | 8000 psi                         |
| Elongation at Break        | 25 %<br>@Thickness 1.59 mm       | 25 %<br>@Thickness 0.0625 in     |
|                            | 30 %<br>@Diameter 12.7 mm        | 30 %<br>@Diameter 0.500 in       |
| Modulus of Elasticity      | 68.9 GPa                         | 10000 ksi                        |
| Ultimate Bearing Strength  | 228 MPa                          | 33100 psi                        |
| Bearing Yield Strength     | 103 MPa                          | 14900 psi                        |
| Poissons Ratio             | 0.33                             | 0.33                             |
| Fatigue Strength           | 62.1 MPa<br>@# of Cycles 5.00e+8 | 9000 psi<br>@# of Cycles 5.00e+8 |
| Machinability              | 30 %                             | 30 %                             |
| Shear Modulus              | 26.0 GPa                         | 3770 ksi                         |
| Shear Strength             | 82.7 MPa                         | 12000 psi                        |

| Electrical Properties  | Metric                                    | English                                   |
|------------------------|---|---|
| Electrical Resistivity | 0.00000366 ohm-cm<br>@Temperature 20.0 °C | 0.00000366 ohm-cm<br>@Temperature 68.0 °F |

| Thermal Properties     | Metric                                     | English                                      |
|------------------------|--|--|
| CTE, linear            | 23.6 µm/m-°C<br>@Temperature 20.0 - 100 °C | 13.1 pin/in-°F<br>@Temperature 68.0 - 212 °F |
|                        | 25.2 µm/m-°C<br>@Temperature 20.0 - 300 °C | 14.0 pin/in-°F<br>@Temperature 68.0 - 572 °F |
| Specific Heat Capacity | 0.896 J/g-°C                               | 0.214 BTU/lb-°F                              |
| Thermal Conductivity   | 180 W/m-K                                  | 1250 BTU-in/hr-ft <sup>2</sup> -°F           |
| Melting Point          | 582 - 651.7 °C                             | 1080 - 1205 °F                               |

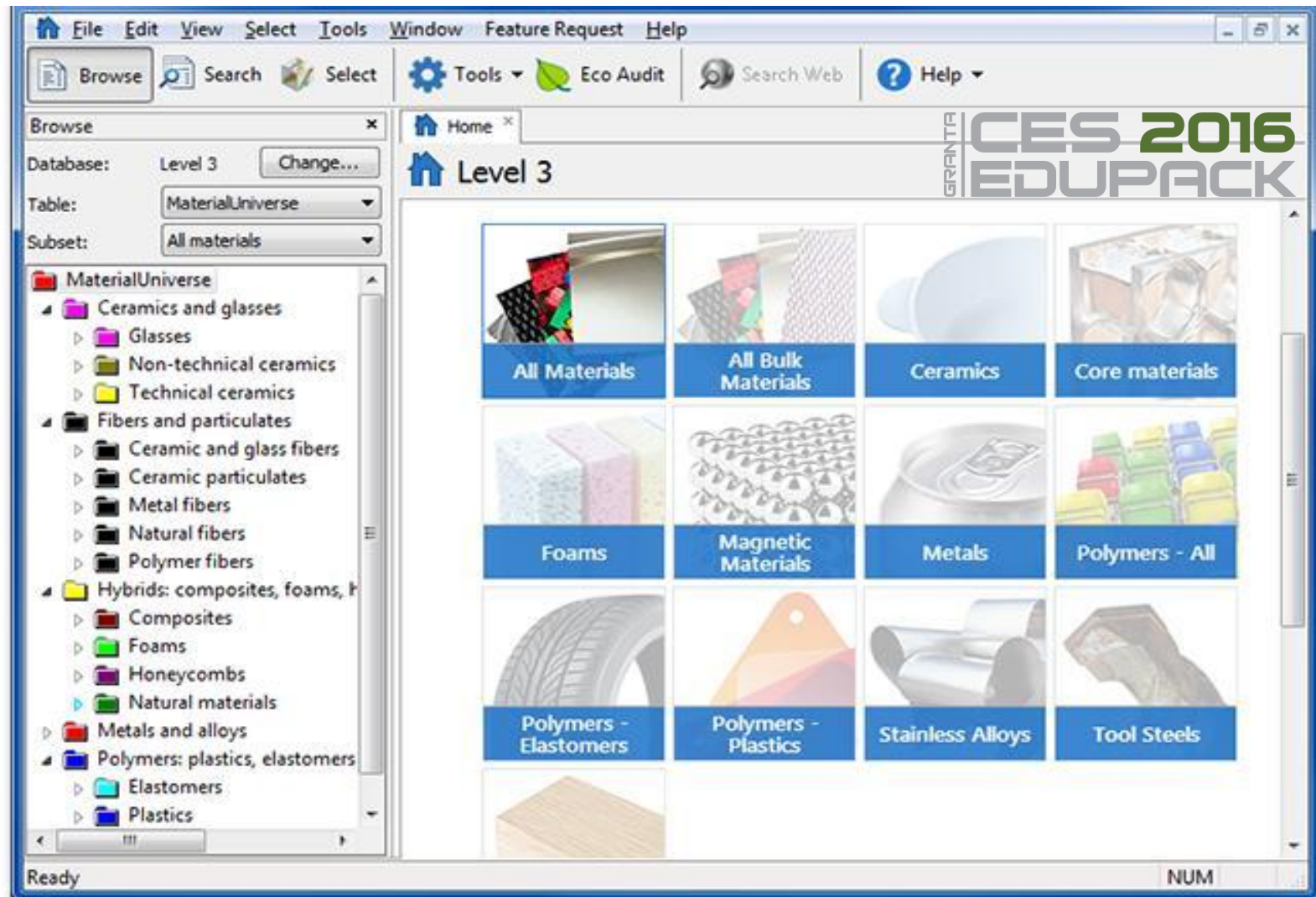
|          |          |         |
|----------|----------|---------|
| Solidus  | 582 °C   | 1080 °F |
| Liquidus | 651.7 °C | 1205 °F |

| Processing Properties | Metric | English |
|-----------------------|--------|---------|
| Solution Temperature  | 529 °C | 985 °F  |
| Aging Temperature     | 160 °C | 320 °F  |
|                       | 177 °C | 350 °F  |



# Bases de datos

## ● CES Edupack



# Cartas de Materiales

## Acrylonitrile–butadiene–styrene (ABS)

### *The Material*

ABS (acrylonitrile–butadiene–styrene) is tough, resilient and easily molded. It is usually opaque, although some grades can now be transparent, and it can be given vivid colors. ABS–PVC alloys are tougher than standard ABS and, in self-extinguishing grades, are used for the casings of power tools.

### *General properties*

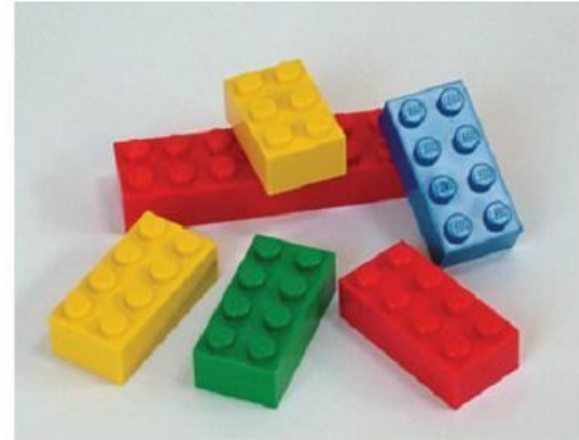
|         |     |   |                         |
|---------|-----|---|-------------------------|
| Density | 1e3 | – | 1.2e3 kg/m <sup>3</sup> |
| Price   | 2   | – | 2.7 USD/kg              |

### *Mechanical properties*

|                      |     |   |                          |
|----------------------|-----|---|--------------------------|
| Young's modulus      | 1.1 | – | 2.9 GPa                  |
| Hardness—Vickers     | 5.6 | – | 15 HV                    |
| Elastic limit        | 19  | – | 51 MPa                   |
| Tensile strength     | 28  | – | 55 MPa                   |
| Compressive strength | 31  | – | 86 MPa                   |
| Elongation           | 1.5 | – | 1e2 %                    |
| Endurance limit      | 11  | – | 22 MPa                   |
| Fracture toughness   | 1.2 | – | 4.3 MPa.m <sup>1/2</sup> |

### *Typical uses*

Safety helmets; camper tops; automotive instrument panels and other interior components; pipe fittings; home-security devices and housings for small appliances; communications equipment; business machines; plumbing hardware; automobile grilles; wheel covers; mirror housings; refrigerator liners; luggage shells; tote trays; mower shrouds; boat hulls; large components for recreational vehicles; weather seals; glass beading; refrigerator breaker strips; conduit; pipe for drain-waste-vent (DWV) systems.



### *Thermal properties*

|                      |      |   |                 |
|----------------------|------|---|-----------------|
| Thermal conductivity | 0.19 | – | 0.34 W/m.k      |
| Thermal expansion    | 85   | – | 230 μ strain/°C |
| Specific heat        | 1400 | – | 1900 J/kg.K     |
| Glass temperature    | 88   | – | 130 °C          |
| Max service temp.    | 62   | – | 90 °C           |

### *Electrical properties*

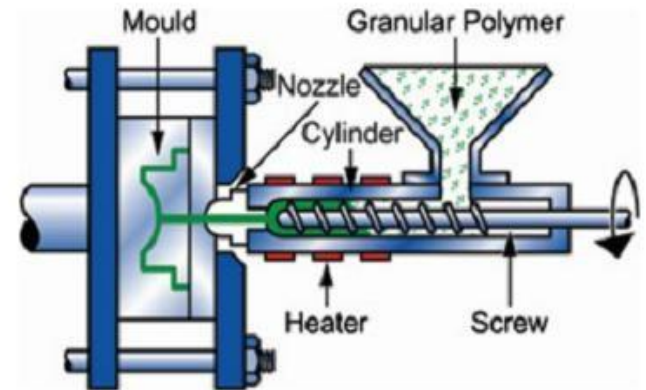
|                     |        |   |              |
|---------------------|--------|---|--------------|
| Resistivity         | 2.3e21 | – | 3e22 μohm.cm |
| Dielectric constant | 2.8    | – | 2.2          |

# Cartas de Procesos

## Injection molding

### The process

No other process has changed product design more than INJECTION MOLDING. Injection molded products appear in every sector of product design: consumer products, business, industrial, computers, communication, medical and research products, toys, cosmetic packaging and sports equipment. The most common equipment for molding thermoplastics is the reciprocating screw machine, shown schematically in the figure. Polymer granules are fed into a spiral press where they mix and soften to a dough-like consistency that can be forced through one or more channels ('sprues') into the die. The polymer solidifies under pressure and the component is then ejected.



### Physical attributes

|                                   |      |   |     |    |
|-----------------------------------|------|---|-----|----|
| Mass range                        | 1e-3 | – | 25  | kg |
| Range of section thickness        | 0.4  | – | 6.3 | mm |
| Surface roughness (A = v. smooth) | A    |   |     |    |

### Economic attributes

|                             |           |   |     |
|-----------------------------|-----------|---|-----|
| Economic batch size (units) | 1e4       | – | 1e6 |
| Relative tooling cost       | very high |   |     |
| Relative equipment cost     | high      |   |     |
| Labor intensity             | low       |   |     |

### Typical uses

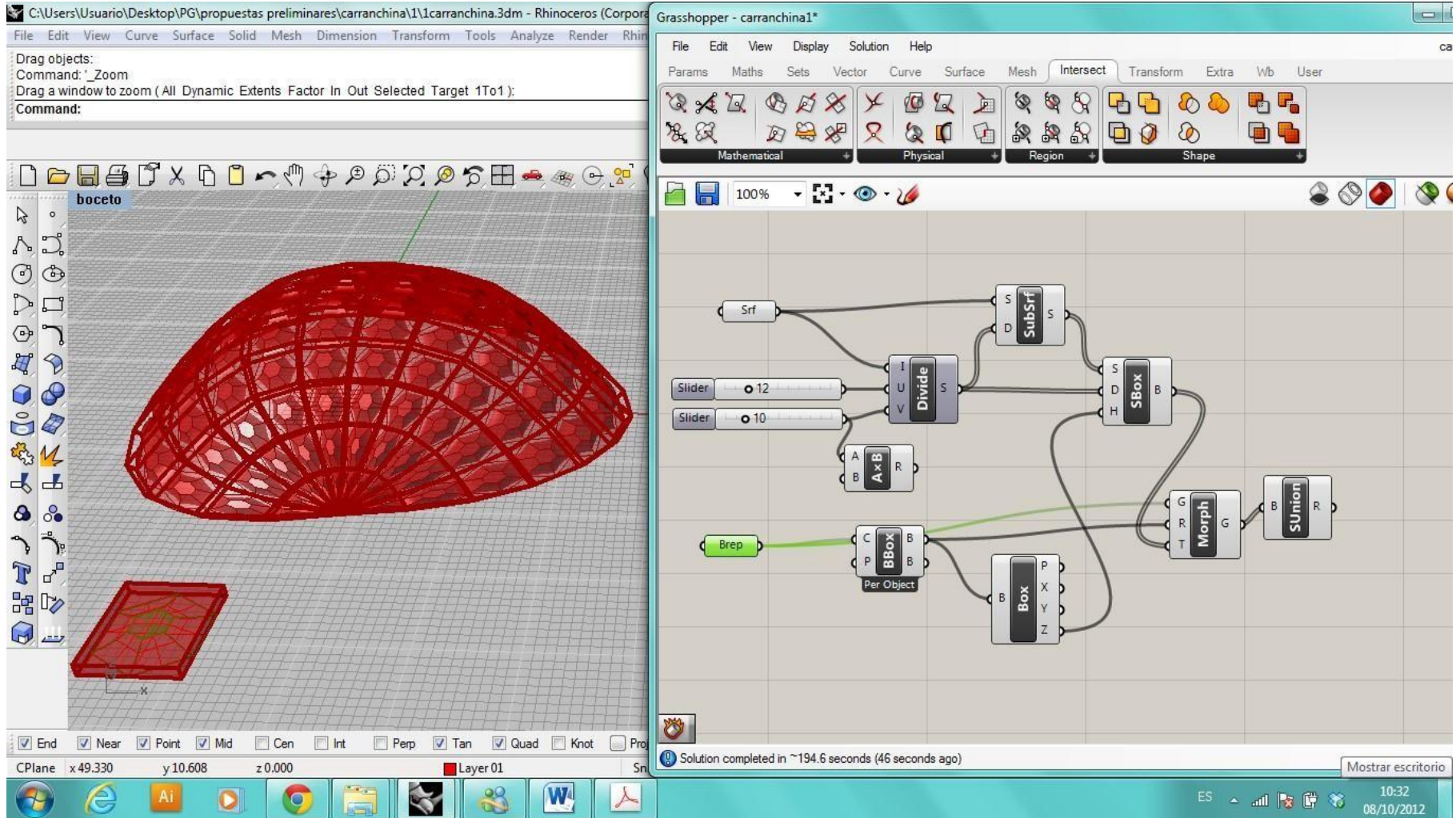
Extremely varied. Housings, containers, covers, knobs, tool handles, plumbing fittings, lenses, etc.

### Shape

|                        |      |
|------------------------|------|
| Circular prismatic     | True |
| Non-circular prismatic | True |
| Solid 3-D              | True |
| Hollow 3-D             | True |

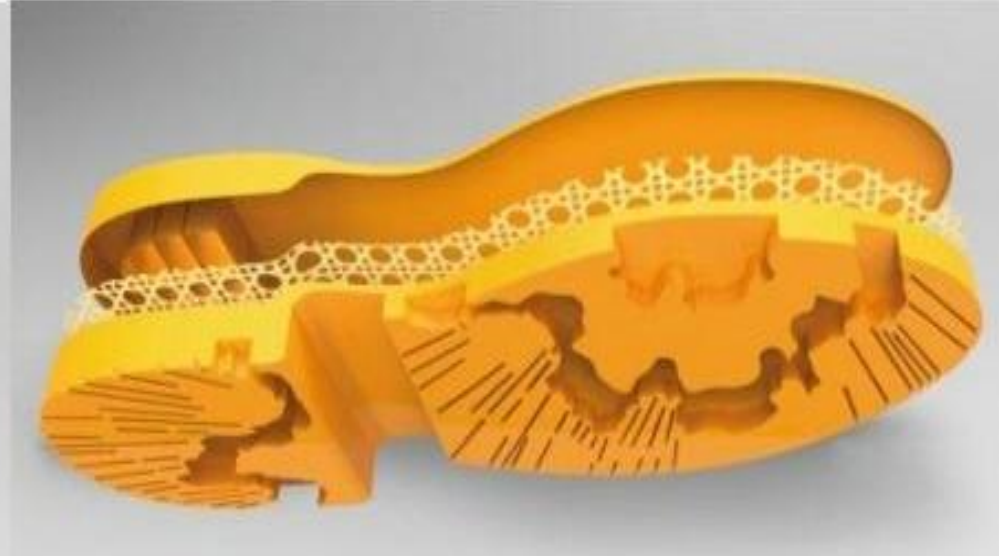
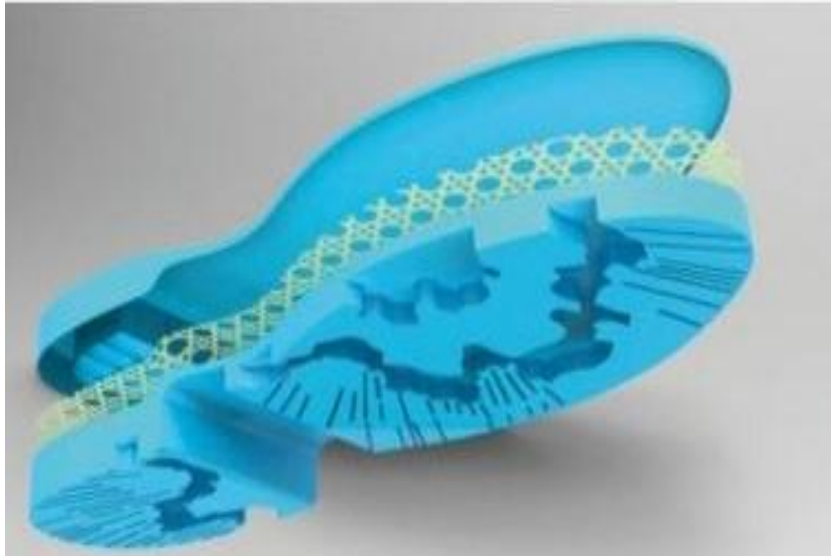
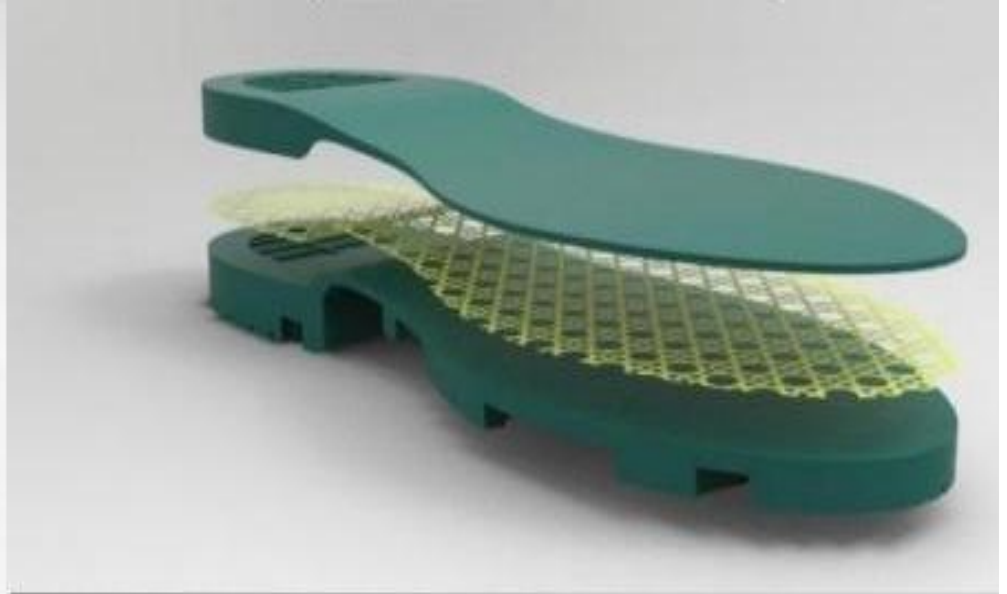


# Modelado y simulación



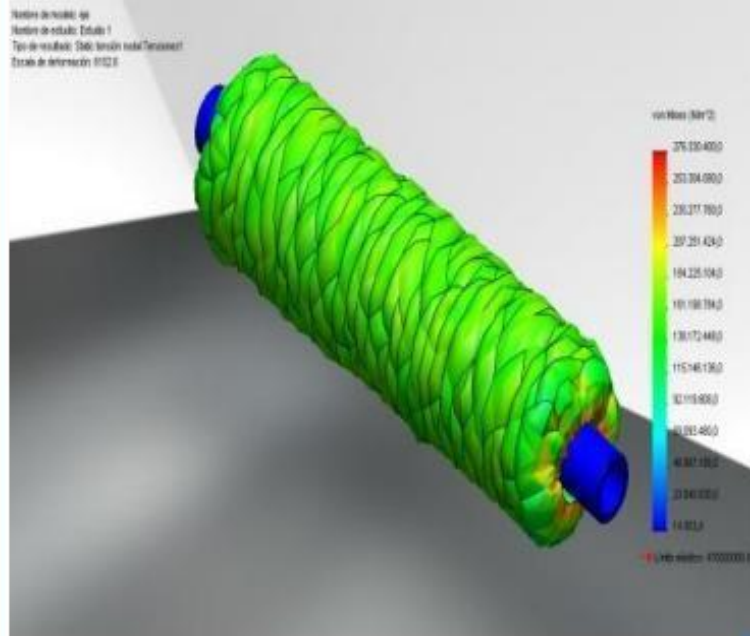


# Modelado y simulación



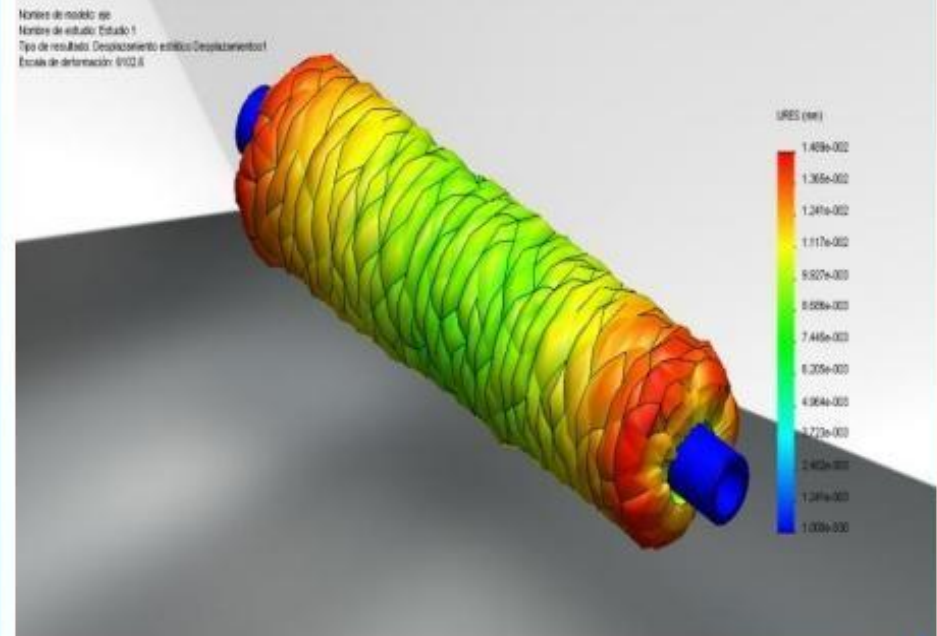
# Modelado y simulación

| Nombre     | Tipo                               | Mín.                             | Máx.                               |
|------------|------------------------------------|----------------------------------|------------------------------------|
| Tensiones1 | VON:<br>Tensión<br>de von<br>Mises | 14503.4<br>N/m^2<br>Nodo:<br>610 | 2.7633e+00<br>8 N/m^2<br>Nodo: 179 |



eje-Estudio 1-Tensiones-Tensiones1

| Nombre           | Tipo                                  | Mín.               | Máx.                             |
|------------------|---------------------------------------|--------------------|----------------------------------|
| Desplazamientos1 | URES:<br>Desplazamiento<br>resultante | 0 mm<br>Nodo:<br>1 | 0.0148909<br>mm<br>Nodo:<br>1370 |



eje-Estudio 1-Desplazamientos-Desplazamientos1

# Modelado y simulación



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