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Techno-Polymer for Metal Replacement in Domestic Appliances

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Engineer - Innovation Manager

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- THE COMPANY
- ASPIRATION HOB NIKOLATESLA
- AIM OF THE METAL REPLACEMENT PROJECT
- CONSTRAINTS AND TECHNICAL SPECIFICATIONS
- POLYMER HOMOLOGATION
- MOLD AND COMPONENT DESIGN
- MOLD TESTING AND COMPONENT APPROVAL
- RESULTS AND CONCLUSIONS

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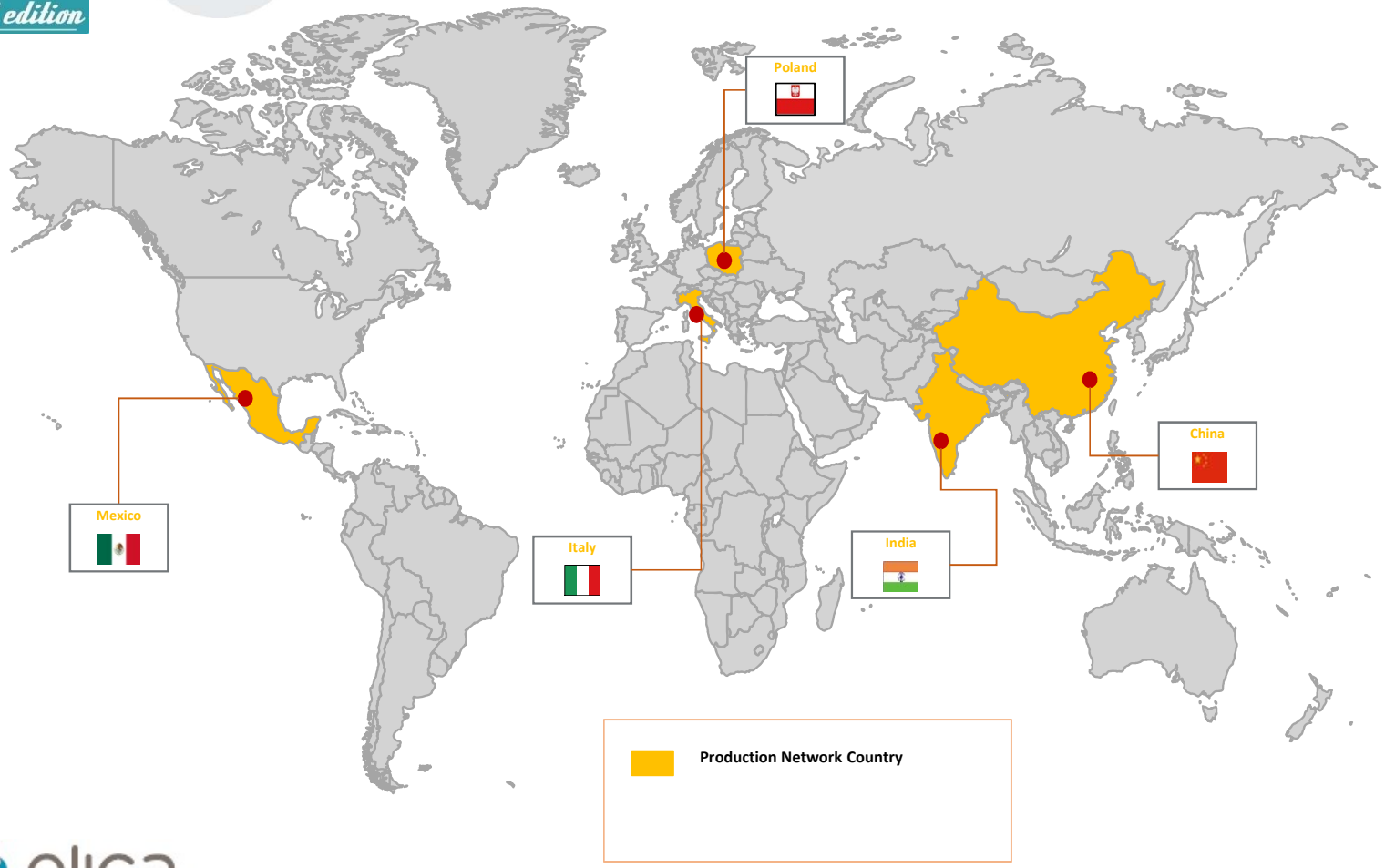
The Company



7 production plants in Italy, Poland, India, China and Mexico

- Italian sites (3) dedicated to high-end and low-end products
- The remaining European production is carried out in Poland
- America is entirely served by the Mexican plant
- Local-for-local approach in China, India and Japan (production controlled by the company's partner, Fuji)

Sales in > 100 countries

- Qualified retail chains (especially in France and the UK)
- Distributors (serving furniture and household appliance shops, kitchen studios and contractors)
- Kitchen manufacturers which serve kitchen and furniture shops

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The Company

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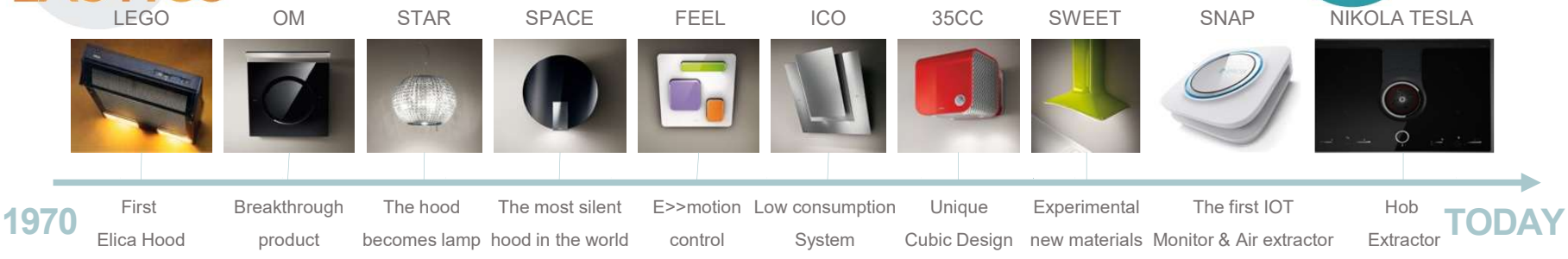

PROMISE

A unique and distinctive Brand with an emotional design and a technological imprinting that gives value to you and your home

PURPOSE VALUES

Design | Innovation | Expertise

PIONEERSHIP

REASON TO BELIEVE

More than 65 **Design Awards**

With over 130 **Patents** (25 patents per year)

A number of **world firsts**

EPL Elica Propulsion Lab

World-class Innovation and testing Lab (€2.5m in 2017)

PAY OFF

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Range Hoods

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Aspiration Hobs

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Aspiration Hob Nikolatesla

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Elica's first aspiration hob

- ***Energy class A+***
- ***Air flow > 600 m³ /h***

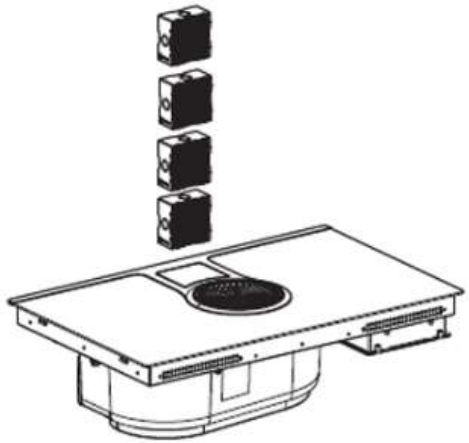
- **Duct out version**

- Cooking fumes are conveyed outside by ventilation ducts placed under the hob
- Different installation set-up thanks to a wide range of accessories provided by Elica

- **Recirculating version**

- In the filtering version the aspiration hob is equipped with everything needed for the installation, including the chrome plated profile of the air outlet
- Thanks to the special accessories provided by Elica the installation is possible even in kitchens with plinth only 60mm high

Aspiration Hob Nikolatesla



By using the specific cover situated in the back side of the hob, the user can remove the filter protection and replace the ceramic odour filters with the support of the extraction belt.

The entire filter pack is made up of 4 blocks , each presenting 4 filter units

Ceramic Filters - Elica
Ceramic
16 units / 4 blocks
High mechanical resistance
Odour filtering efficency: 80%
Dishwasher is not necessary. Regeneration in oven @ 200°C, 45 minutes, every 2-3 months
Average lifetime: 5 years
Antimicrobial

Aspiration Hob Nikolatesla

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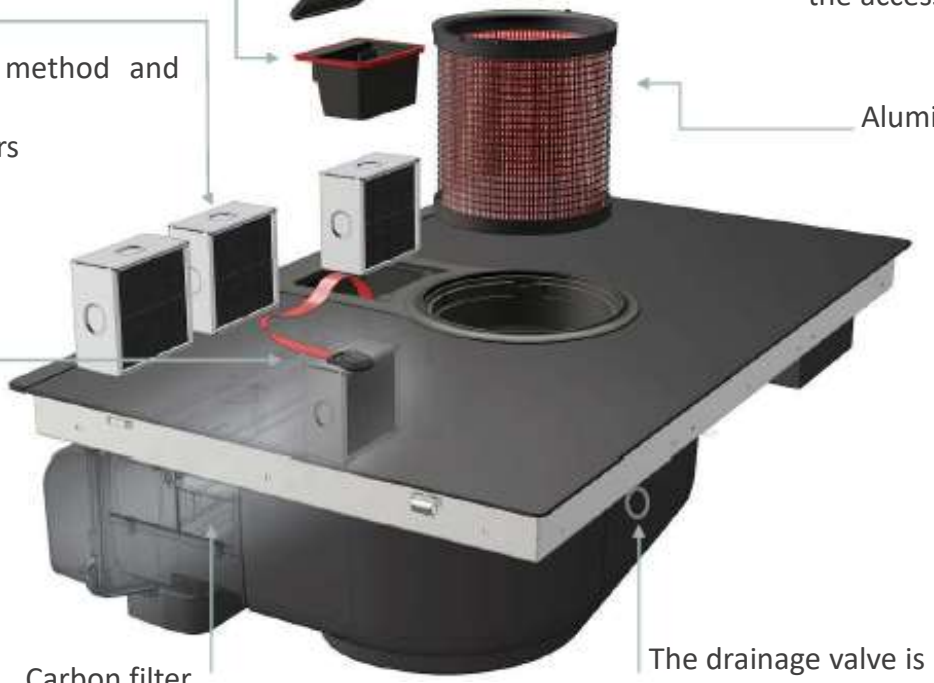
Cover

Filter protection

Aesthetic grid: After the removal of the central grid with a simple rotational movement, the user has the access to the grass filter

Ceramic odour filters with active carbons.
The saturation time depends on the cooking method and cleaning frequency of the filter.
Regeneration allows a maximum life time of 5 years

Aluminum filter grid



Ceramic filters removal belt

Carbon filter surface

The drainage valve is placed under the hob and it can be opened in order to remove liquid residuals gone accidentally under the hob

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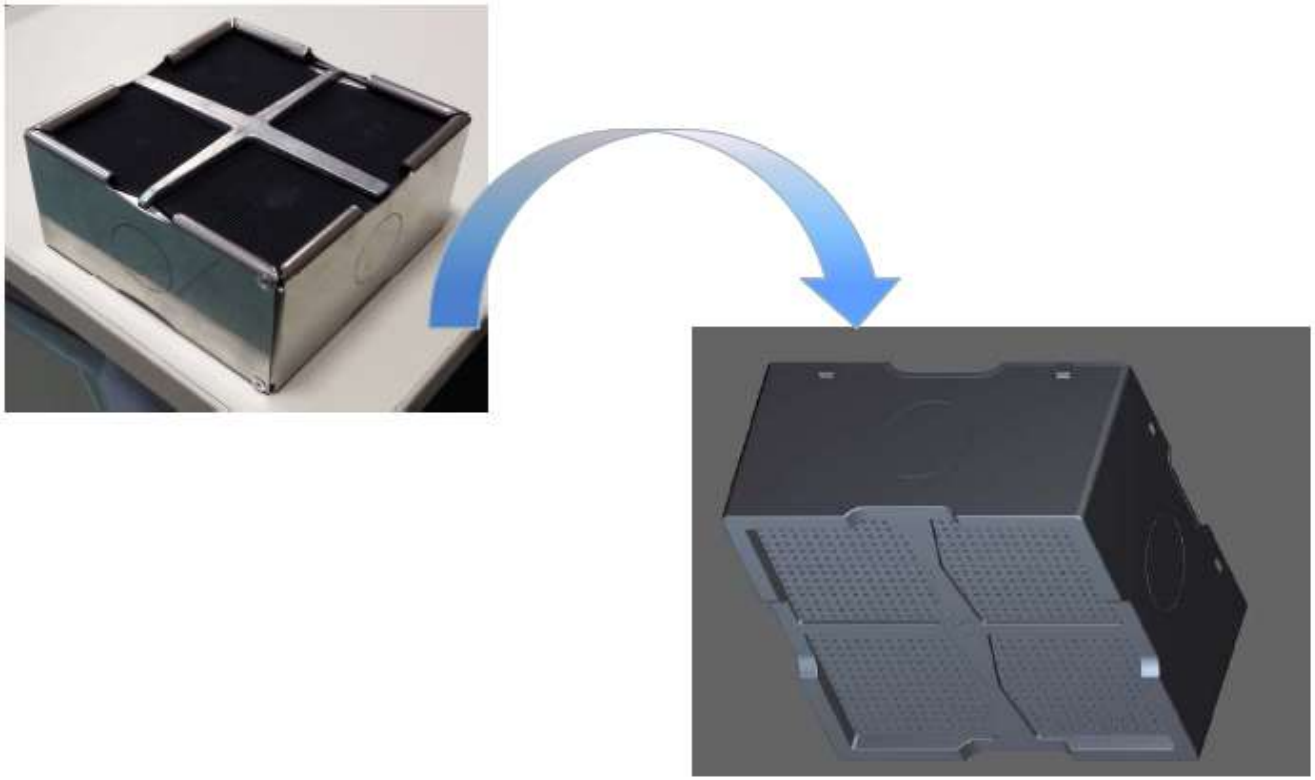
Aim Of The Metal Replacement Project

- **Advantages**

- More professional aestethic
- Cost reduction
- Removal of rivets and bends that can obstruct the filter movement
- No sharp edges
- Ceramic filters regeneration



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Constraints and Technical Specifications

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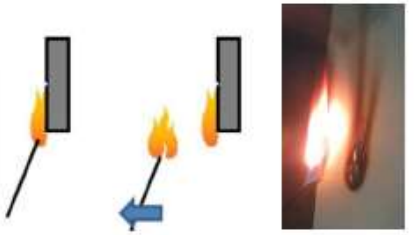
- **High temperature resistance**

- Ceramic odour filters may be regenerated once in every 2/3 months in a domestic oven at 200°C for 30 min up to 120 min depending on the cooking methods and regeneration frequency

- Heat Distorsion Temperature (*ASTM D 648; HDT @1.82MPa*) > 250°C
- RTI (*UL 746*) > 200°C



- **Self-estinguishing grade**

- V – 0 (*UL 94*)

- **Magnetic properties required**

- **Cost reduction in terms of raw material and process**

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Polymer Homologation

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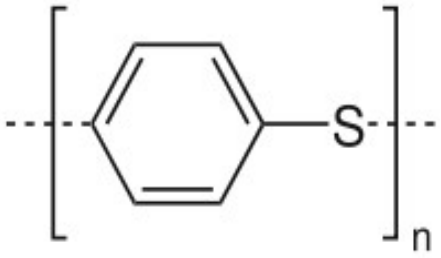
- Scouting
  - Technical database online
  - Supplier research
  - Sector fairs
- PPS resin (polyphenylene sulfide)
  - High mechanical resistance
  - Resistant to high temperature
  - High chemical resistance
  - Low water absorption
  - V-0 flammability behaviour
- Sample manufacturing
  - Samples with variable thickness (0.8 - 3.2 mm)



Polymer Homologation

- Validation process

- Needle Flame Test *(IEC 60695-11-5)*
- Glow Wire Test GWIT 550°C *(IEC 60695-2-13)*
- Ball Pressure Test *(IEC 60695-10-2)*
- Thermal cycles in climatic chamber
- High Temperature thermal cycles (200°C, 45 minutes - standard regeneration cycle for ceramic odour filters)
- High Temperature Thermal cycle (250°C, 120 minutes – simulation of an incorrect regeneration cycle

Polymer Homologation

- Needle Flame Test

Simulation of the effect of flames that can be generated by a malfunction of the electrical apparatus or by the hob.

- **Test setup**: flame height: 12 mm, flame application angle: 45°, time of application: 30 sec

- **Test Success conditions**

  The sample does not ignite

  The tissue paper does not burn after contact with the flame or the incandescent material drops

  The sample burns for less than 30 seconds

Polymer Homologation

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- GWIT

Verification the self-estinguish behaviour and its resistance to the flame propagation

- Time of test: 30 sec
- Force: 1 N
- Temperature: 550 °C

- Ball Pressure test

Verification of the dimensional stability at high temperature with a the application of a load

- Load: 20 N
- Sphere diameter: 5 mm
- Temperature range: 23 °C – 125 °C
- Time of test: 60 min
- Limit of sphere sign: 2 mm

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Mold And Component Design

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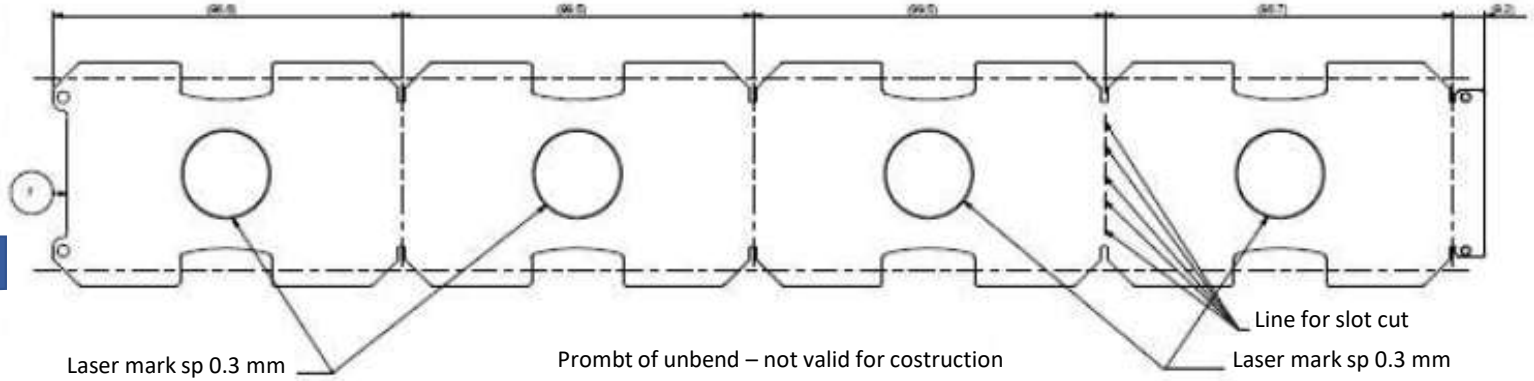
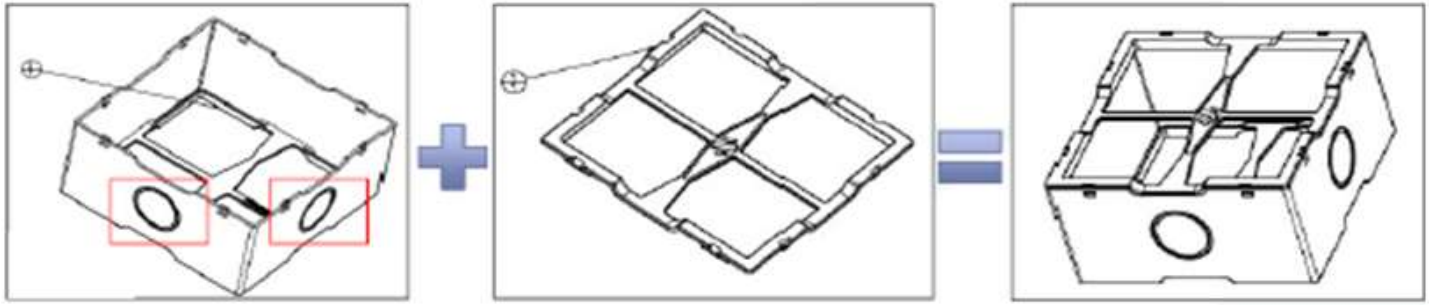
Metallic sheet



PPS Black 40 GF (repropallet) + PPS Black 40 GF + iron oxide



Mold And Component Design

- MOLD SPECIFICATION

- Materials: reinforced PPS
- **Injection molding press:** (Bi-injection) 570S 2200-800
- **Press tonnage:** 200
- **Cavity:** 1
- **Time cycle:** 50 Sec
- **Columns ride:** 570 mm
- **Quality of punch finish:** Medium 400
- **Injection profile 1:** From 270°C to 310°C
- **Injection profile 2:** From 295°C to 320°C
- **Mold / punch temperature:** 130-140°C
- **Movement:** mechanical with cylinders oleo-pneumatic
- **Extraction:** cylinder espulsion
- **Mode of operation:** automatic

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Mold Testing And Component Approval

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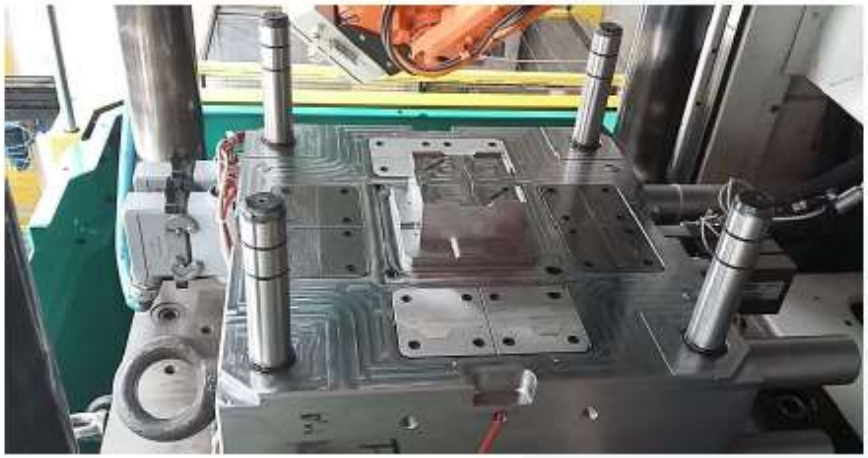

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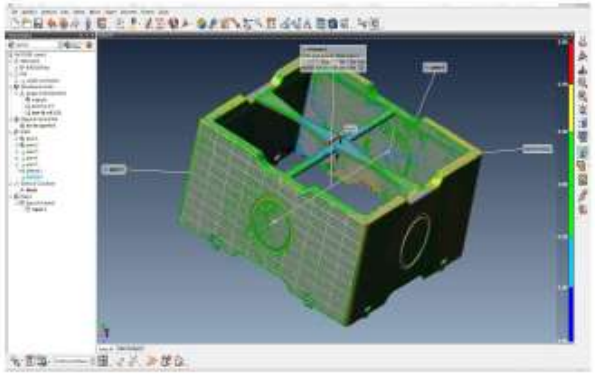
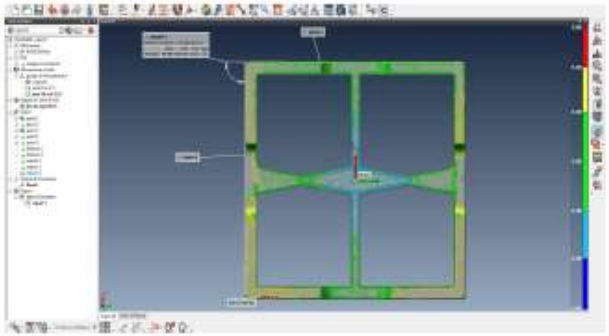
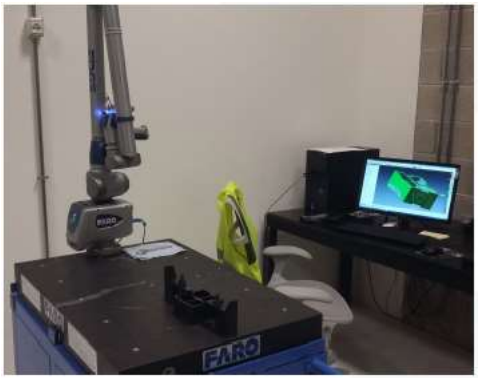
Mold Testing And Component Approval

Dimensional test





- Geometrical validation using 3D metreologichal software
- Emission of dimensional report, verification of tollerance chain and mold approval



Mold Testing And Component Approval

- Verification of self-extinguishing behaviour and thermal properties on the moulded component 13 thermal cycles in oven (200°C, 45 min)

- Life test and assembling test of PPS sheel conducted on the final product (8 weeks with different test condition)

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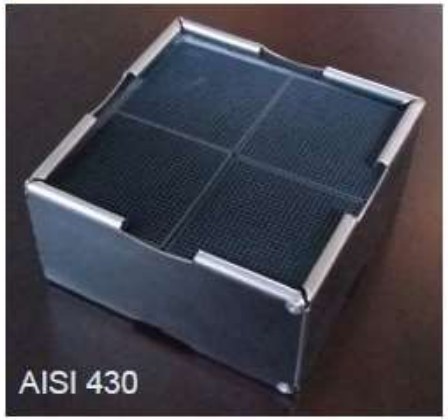
Results And Conclusions



Magnetic properties

Results And Conclusions

SAVING 33%

MAGNETIC PROPERTIES

HIGH IMPACT RESISTANCE

HIGH TEMPERATURE STABILITY

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THANKS FOR YOUR ATTENTION

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