

**mid** Moulding  
Innovation  
Day 2023

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**LATI**

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**Moldex3D**



Ottimizzazione geometrica, estetica e funzionale  
di un dissipatore LED in compound termo-  
conduttivo



# Hexagro è un LATI #CustomerChampion!

[Link al video](#)



LATI Industria Termoplastici S.p.A.

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#CustomerChampion - LATI special plastics in Hexagro's Livin...

Designed and developed by Hexagro, "Living Farming Tree" is a novel vertical garden inspired by the principles of biophilic design. Cutting-edge ideas demand cutting-edge materials and solutions. Hexagro and LATI have teamed up to introduce thermally conductive plastics into the manufacturing of stand-alone heat sinks used to house control electronics, support elements and LED lights for plant life, while reducing weight, ...  
[READ MORE](#)



# Living Farming Tree

hexagro 



**PROTOOL**



# A proposito di LATI



Fondata: **Italia, 1945**

Proprietà: **Famiglia Conterno**



Produzione

2 siti – 40.000 ton. Capacità – 2.500 prodotti attivi



HR

290 dipendenti



Turnover

>150 milioni €



Mercato

1.800 clienti, presenza globale



Innovazione

20 ingegneri in R&D e TECH

# Compound e servizio tecnico



Strutturali



Elettricamente conduttivi



Autolubrificanti



Termicamente conduttivi



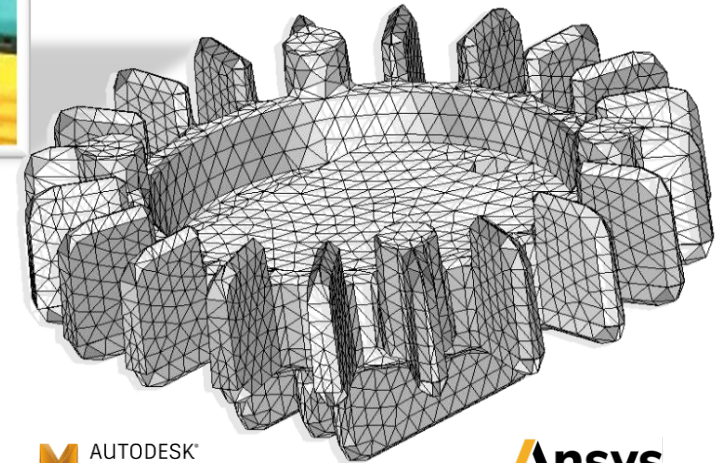
Detettabili



Alte temperature



*Assistenza allo stampaggio*



AUTODESK  
MOLDFLOW

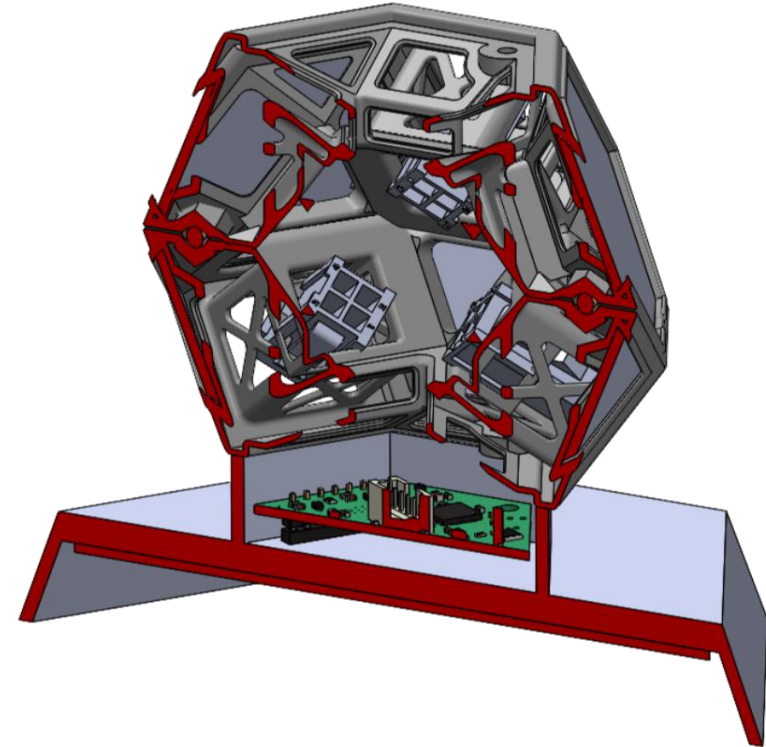
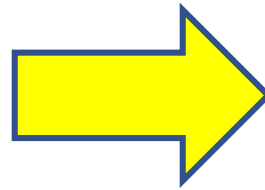
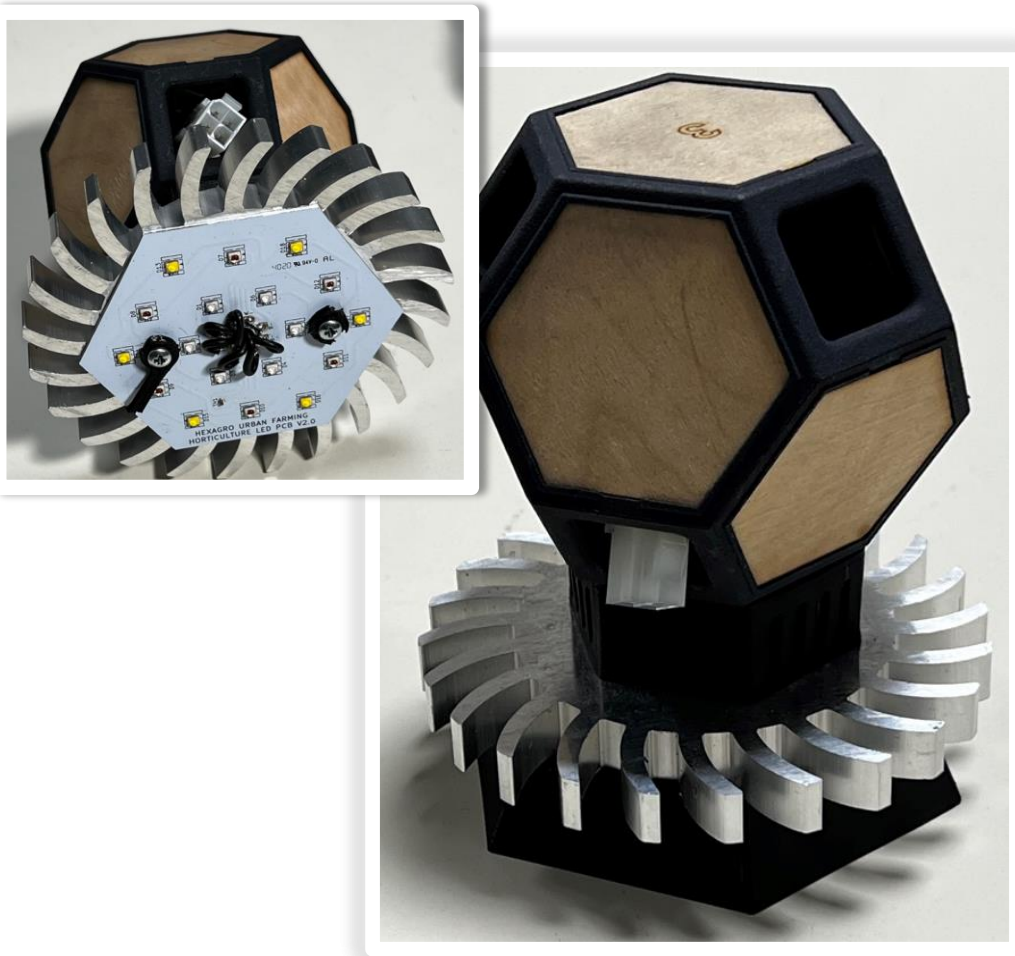
Ansys

Moldex3D

Digmat

Co-design FEM CAE

# Integrazione di funzioni



- Giunzione meccanica per il nodo;
- Supporto per LED PCB e la lente;
- Sede per l'elettronica;
- Dissipatore

# Metal replacement

## Alluminio

- Densità 2,7 g/cm<sup>3</sup>
- Conducibilità termica (ASTM E1461-92, 3 mm)  
  
~ 120 W/mK
- CLTE: 20 ppm
- Emissività: 0,22
- GWP (60% riciclato)\* ~ 4 kg CO<sub>2</sub> eq./kg,  
~ 10,8 kg CO<sub>2</sub> eq./dm<sup>3</sup>

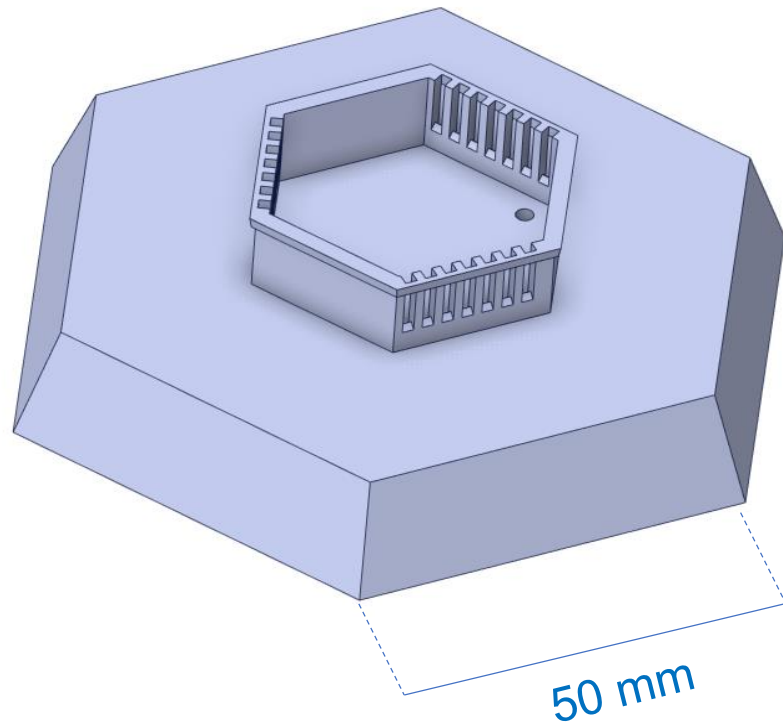
## LATICONTHER 62 GR/50 (PA6, 50% graphite)

- Densità 1,5 g/cm<sup>3</sup>
- Conducibilità termica(ASTM E1461-92, 3 mm)
  - 12 W/mK nel piano
  - 2 W/mK attraverso il piano
- CLTE: 30 ppm
- Emissività : 0,87
- GWP\* ~ 6,5-7 kg CO<sub>2</sub> eq./kg  
~ 9,5 kg CO<sub>2</sub> eq./dm<sup>3</sup>



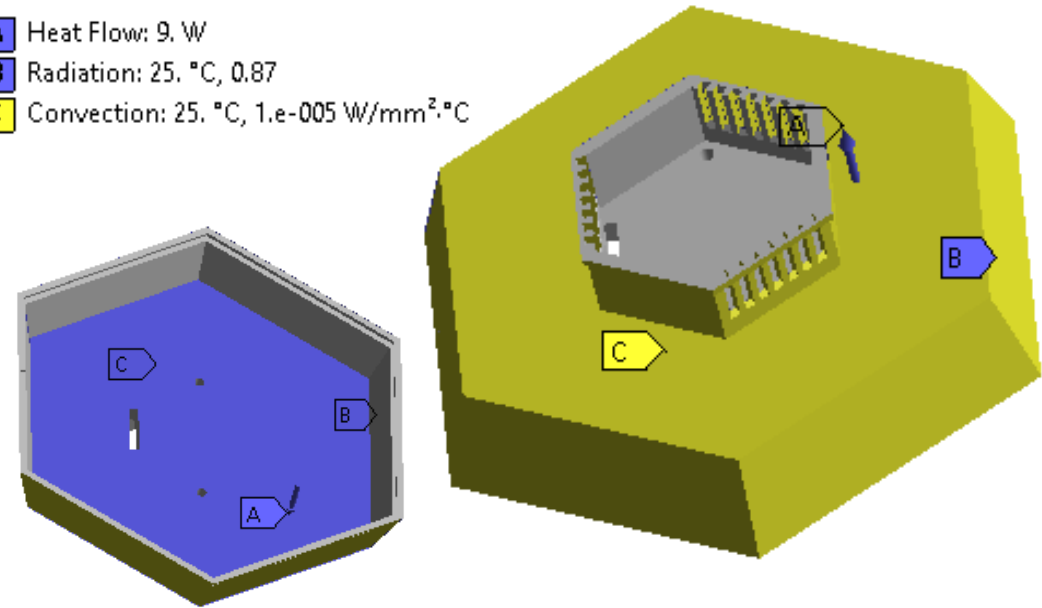
# Valutazione della fattibilità

Input 3D Model



Steady-State Thermal  
Time: 1. s

- A** Heat Flow: 9. W
- B** Radiation: 25. °C, 0.87
- C** Convection: 25. °C, 1.e-005 W/mm<sup>2</sup>·°C



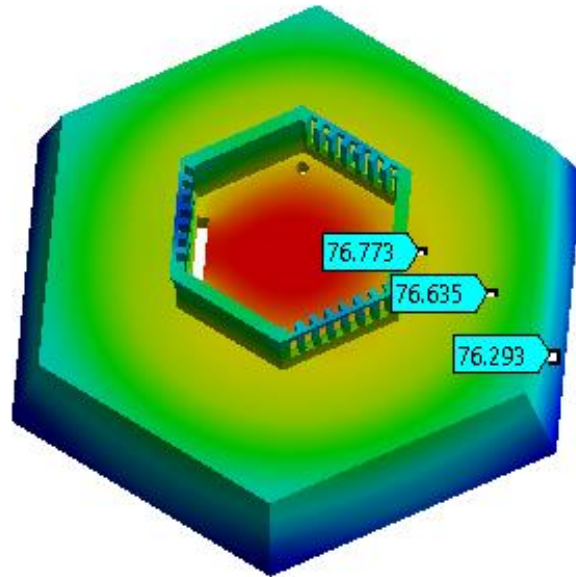
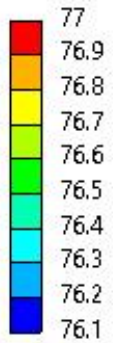
Condizioni al contorno:

- Convezione naturale, temperatura ambiente max. 35°C
- Flusso termico: LED PCB 9W, driver 2W
- Scambio termico attraverso le superfici esterne
- Max. temperatura di sicurezza: 65°C

# Valutazione della fattibilità #1

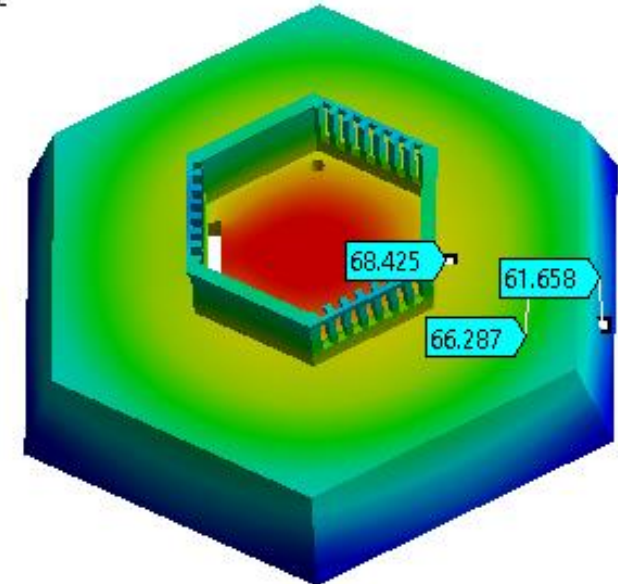
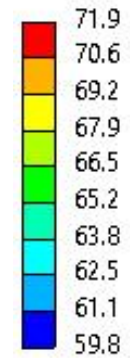
Alluminio

F: Alu, 35°C  
Temperature  
Type: Temperature  
Unit: °C  
Time: 1  
Max: 77  
Min: 76.1



50% grafite

D: GR/50, 35°C  
Temperature  
Type: Temperature  
Unit: °C  
Time: 1  
Max: 71.9  
Min: 59.8



## Valutazione della fattibilità #2

H: GR/50, 35°C, fins addition

Temperature

Type: Temperature

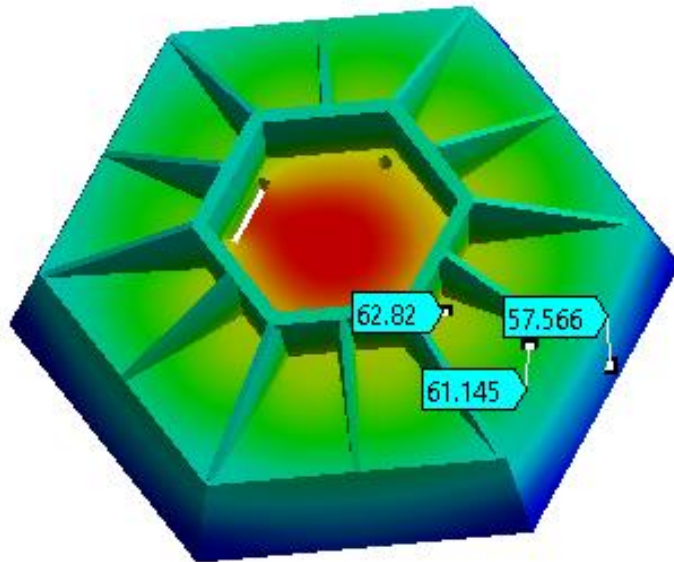
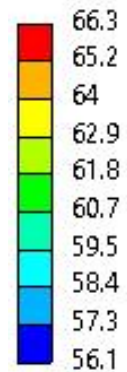
Unit: °C

Time: 1

Custom

Max: 66.3

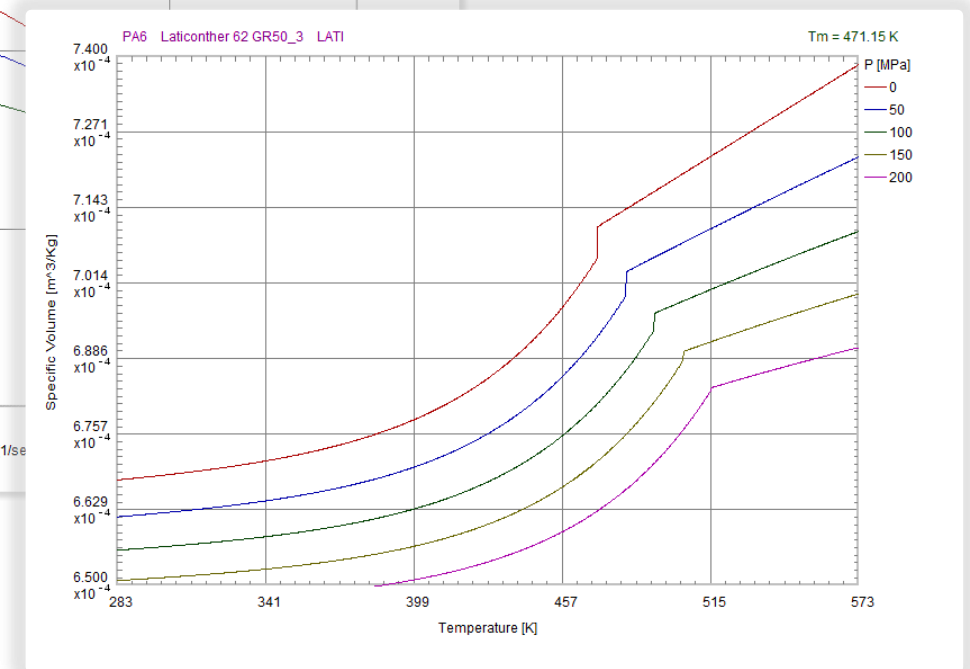
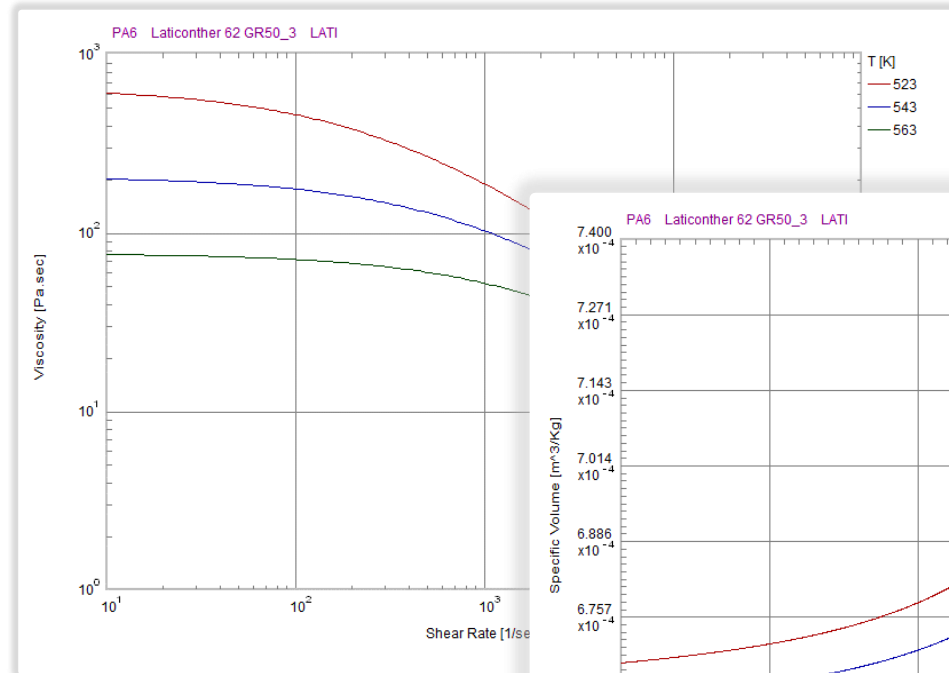
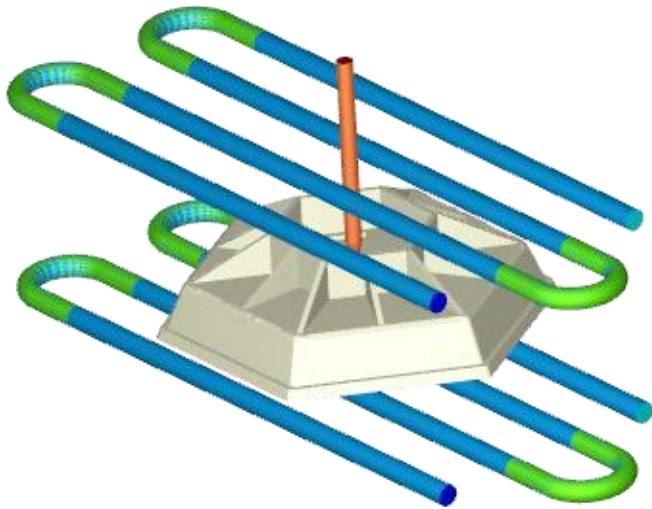
Min: 56.1



- Si aggiungono le alette per migliorare la performance termica
- La temperatura sotto il driver si abbassa di circa 10°C
- La geometria definitiva è pronta per la simulazione con

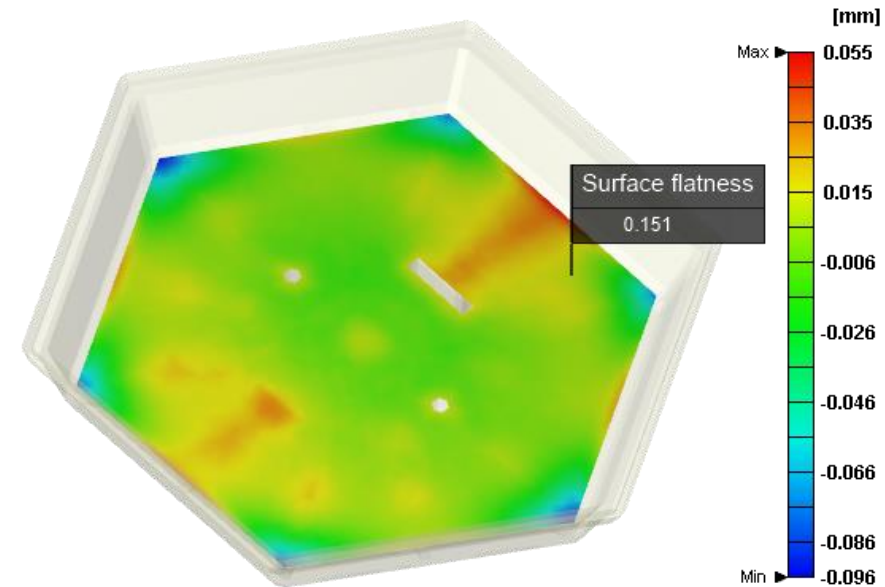
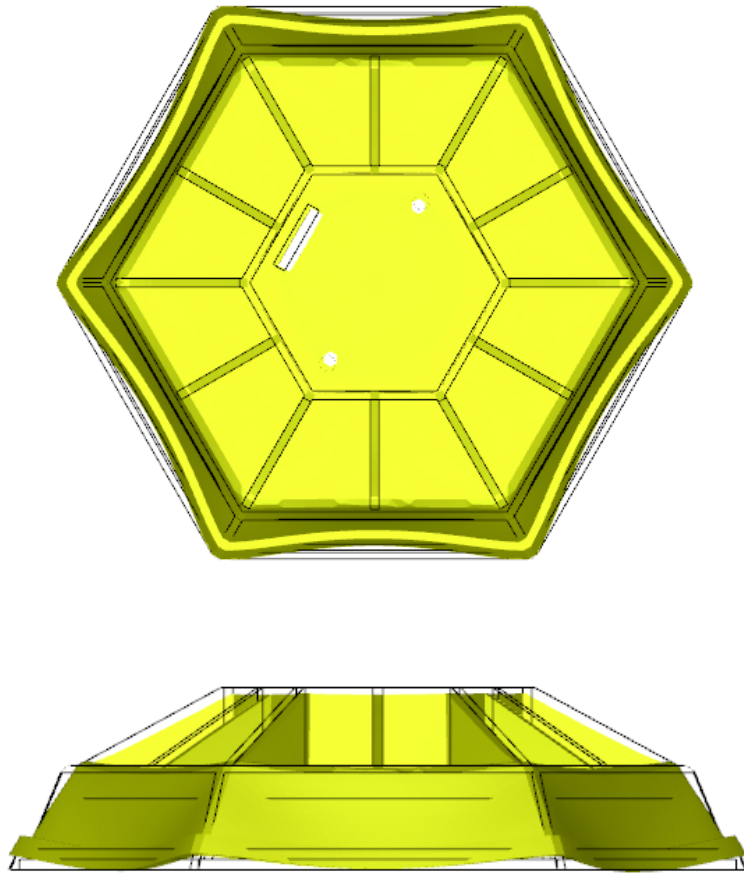
**Moldex3D**

# Simulazione di riempimento





# Studio delle deformazioni



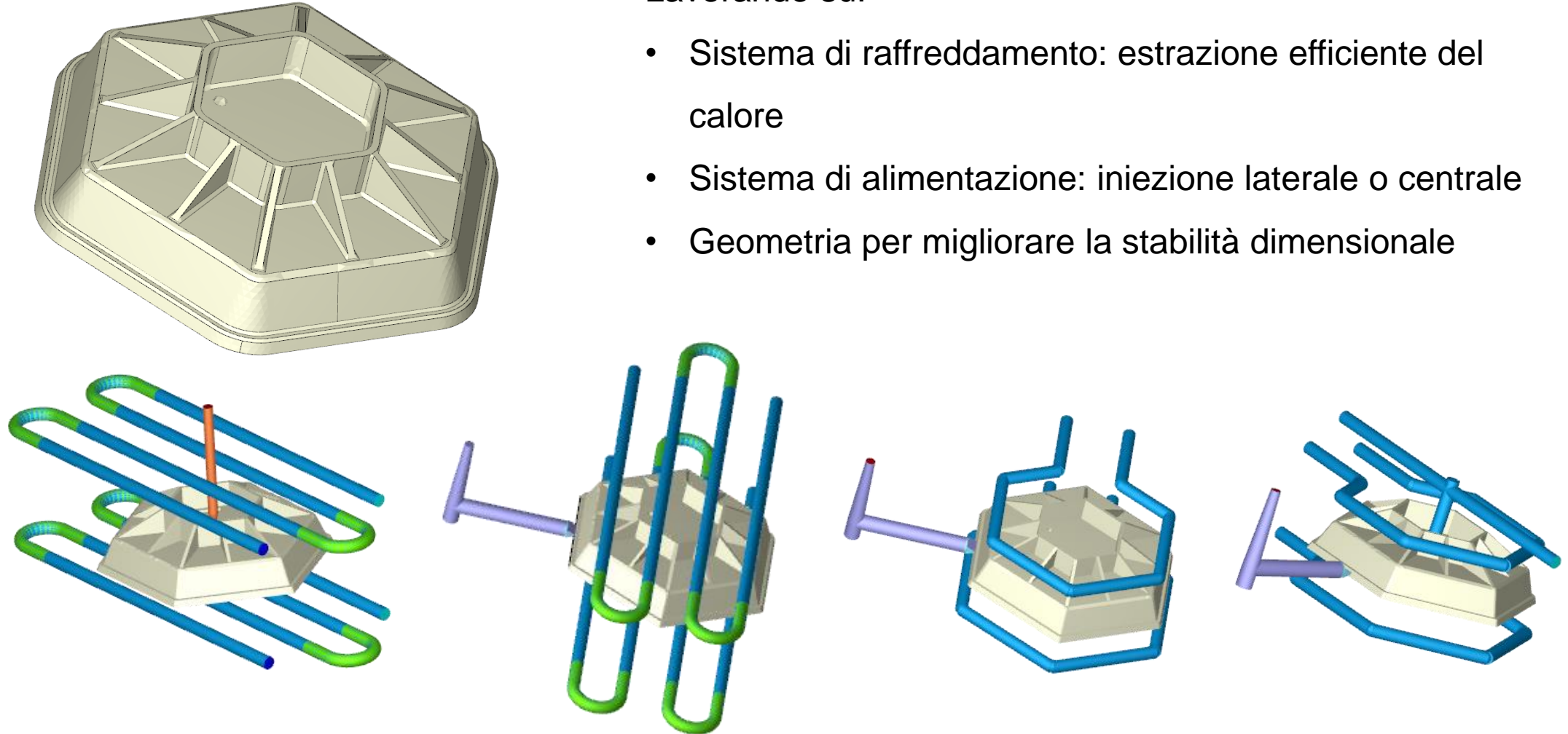
Problemi principali:

- Deformazione degli spigoli (contatto con la lente)
- Planarità da ottimizzare per migliorare la distribuzione di calore

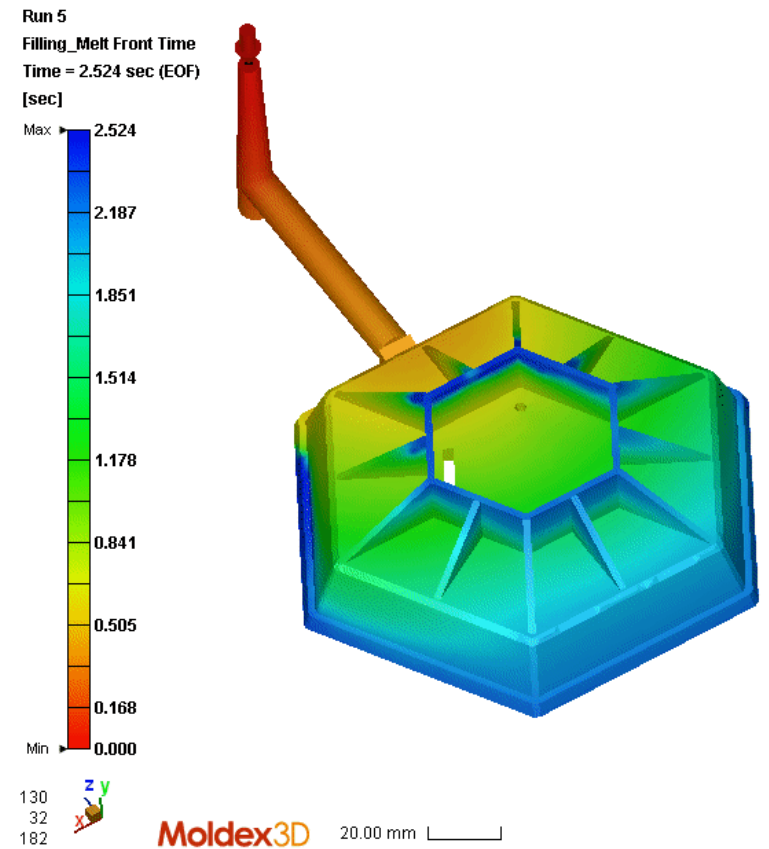
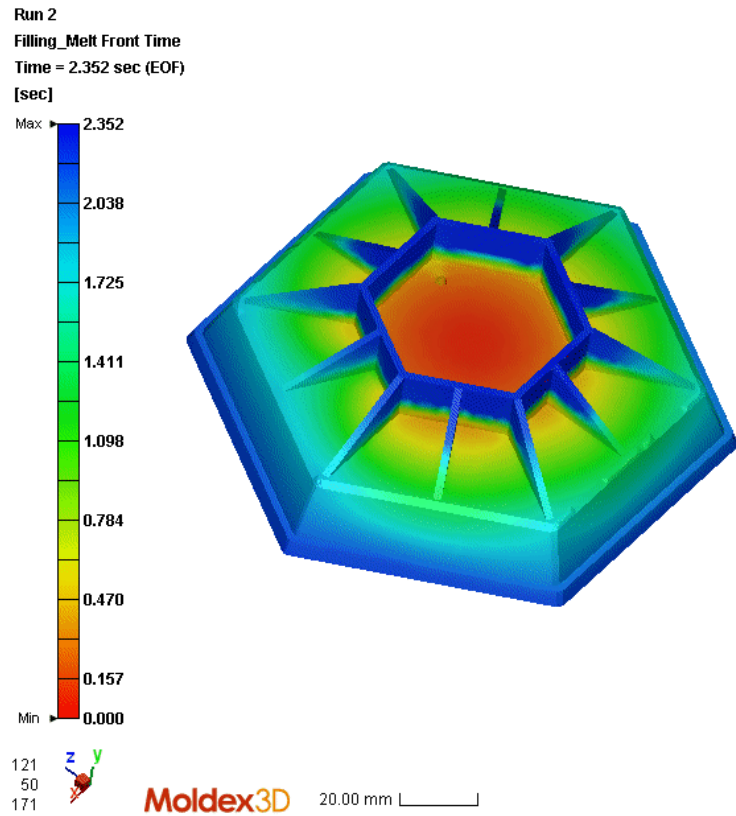
# Ottimizzazione

Lavorando su:

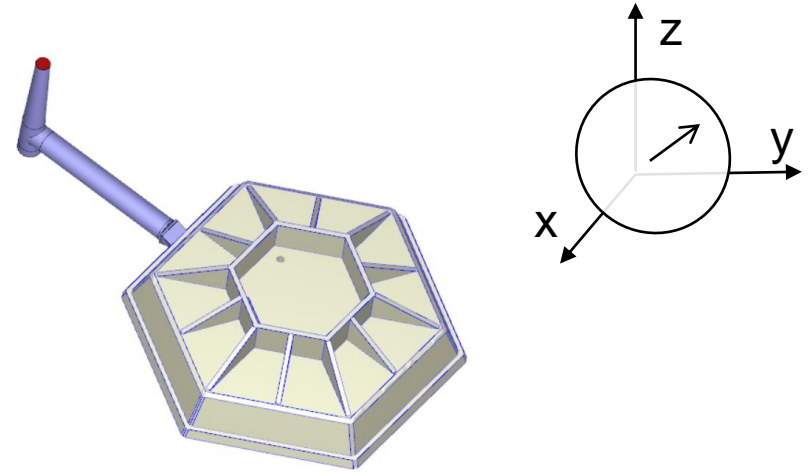
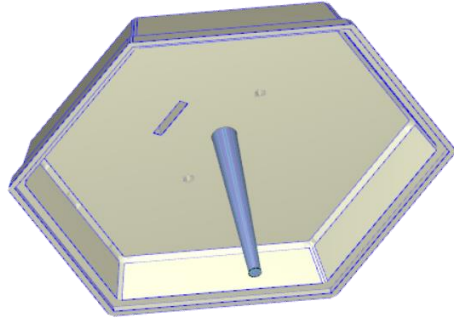
- Sistema di raffreddamento: estrazione efficiente del calore
- Sistema di alimentazione: iniezione laterale o centrale
- Geometria per migliorare la stabilità dimensionale



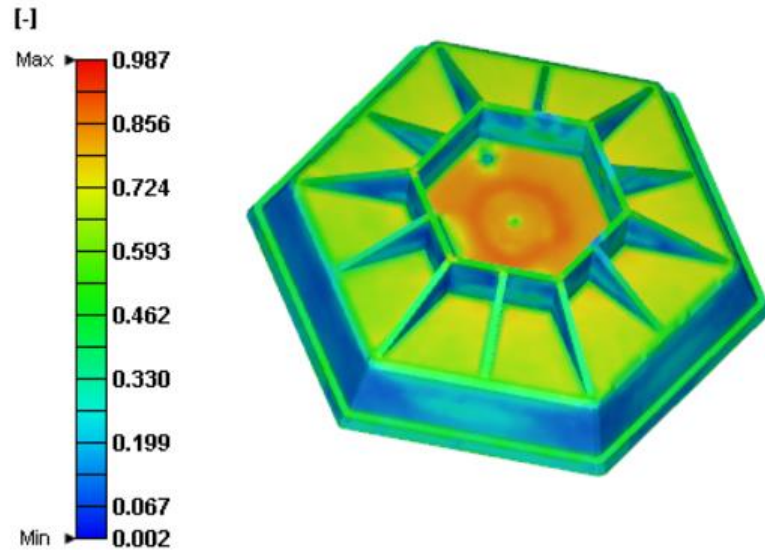
# Configurazioni a confronto



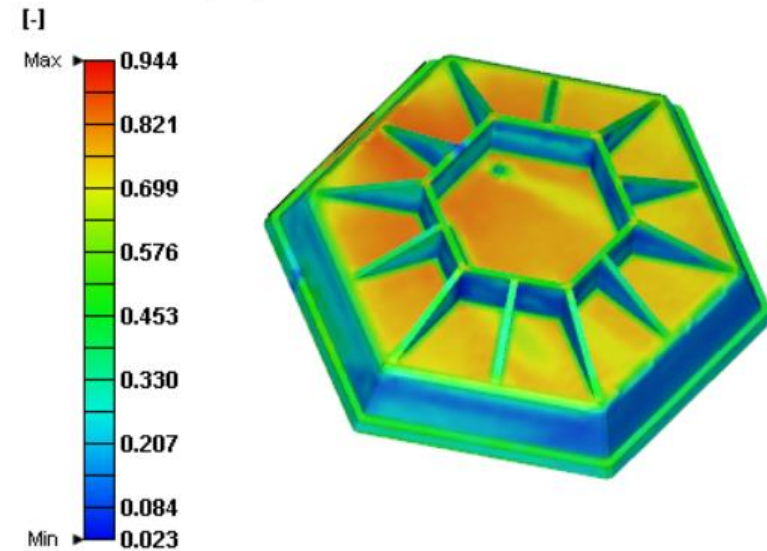
# Orientamento dei flakes di grafite



Filling\_Flake Orientation in Y Direction  
Time = 2.352 sec (EOF)

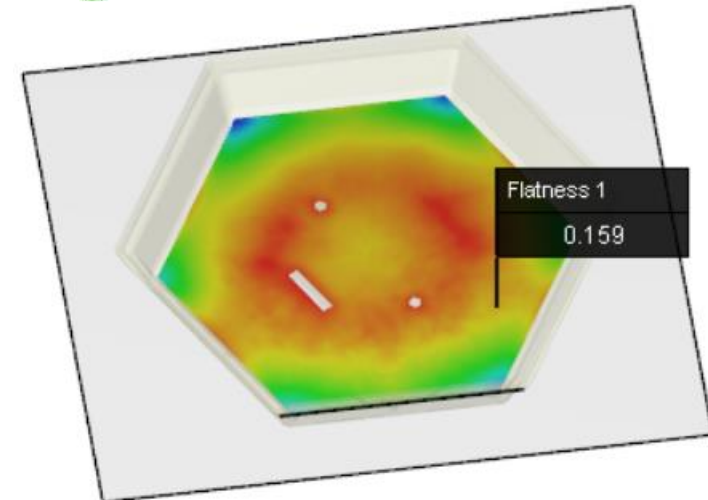
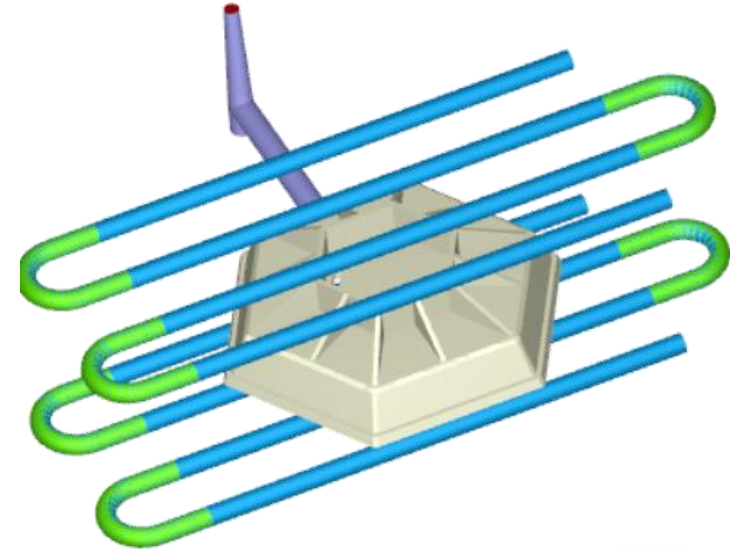
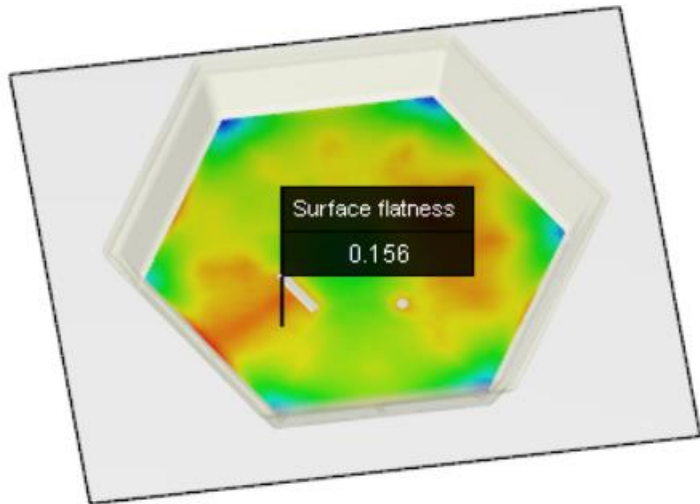
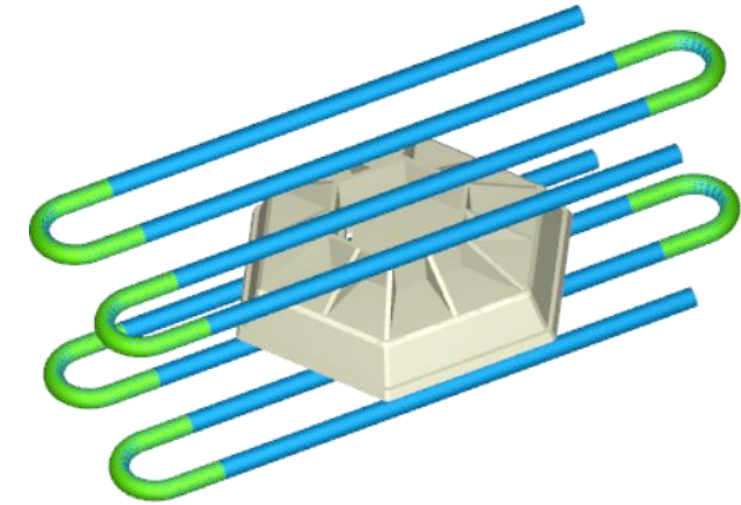


Filling\_Flake Orientation in Y Direction  
Time = 2.658 sec (EOF)

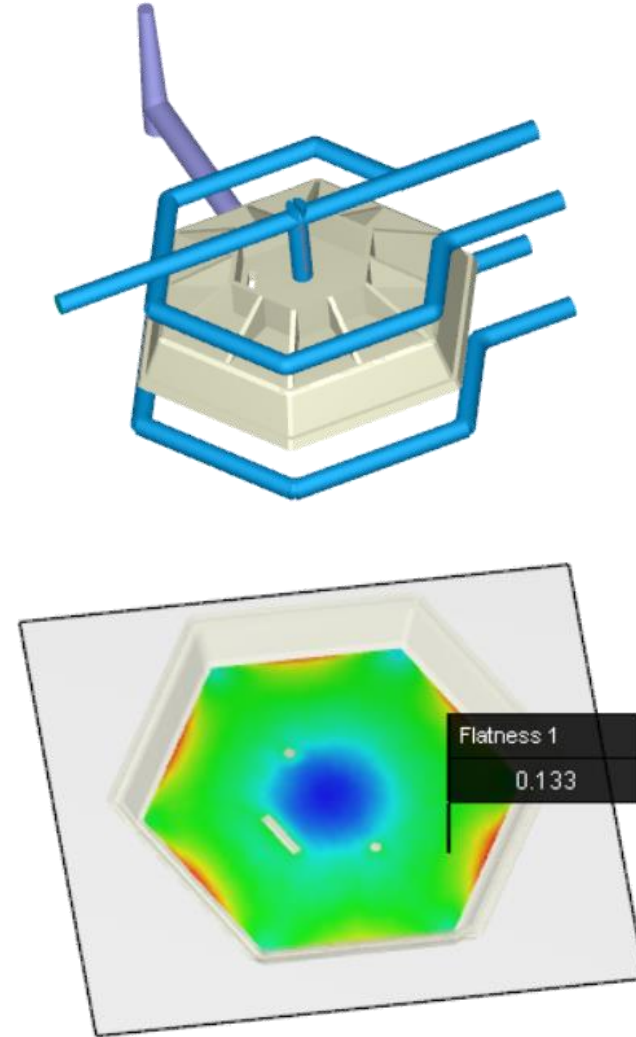
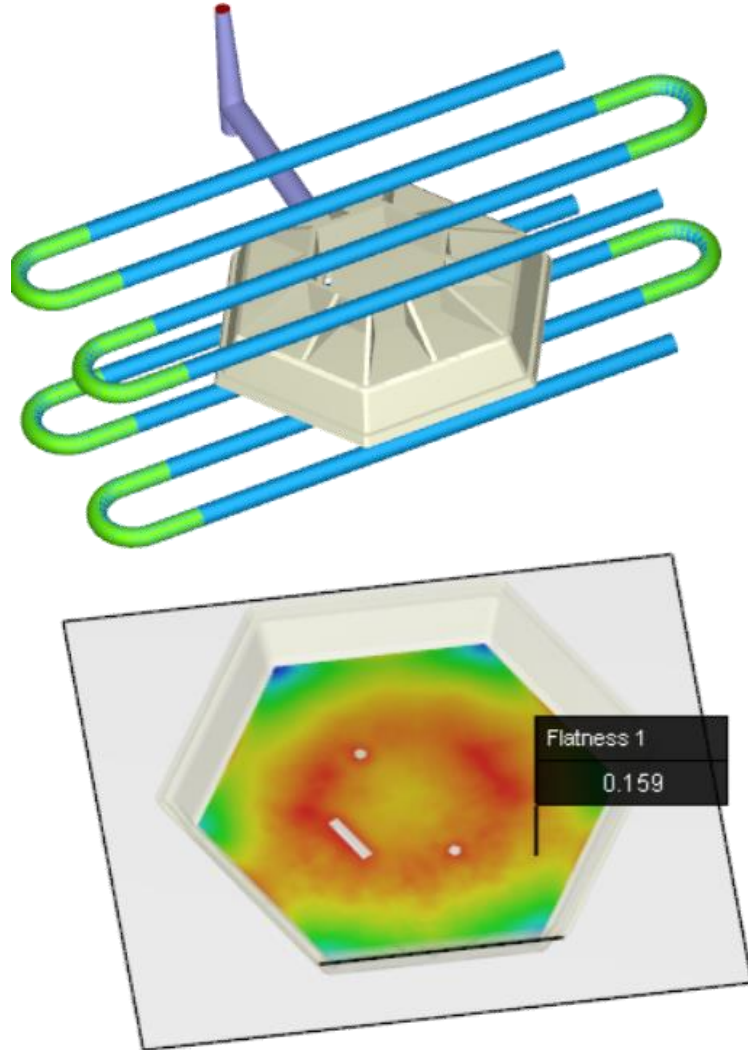




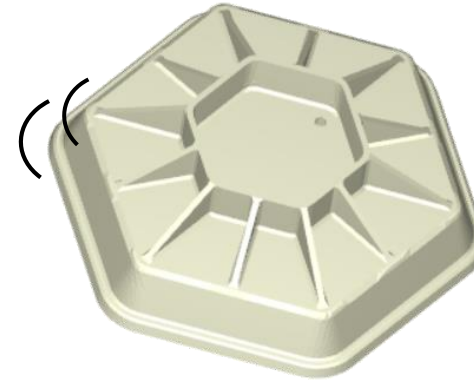
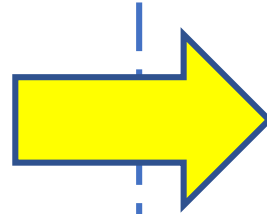
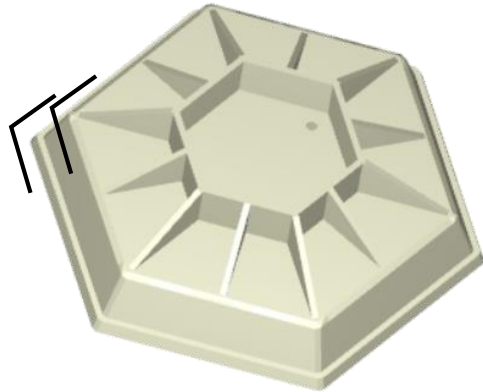
# Planarità della superficie di contatto



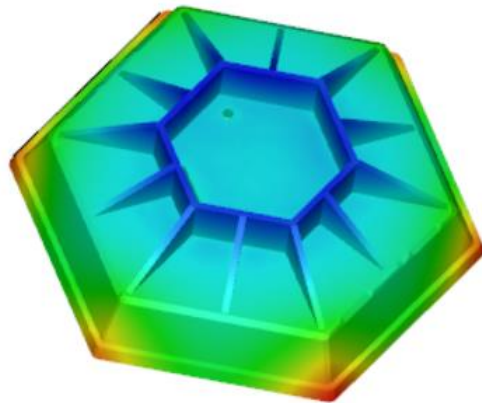
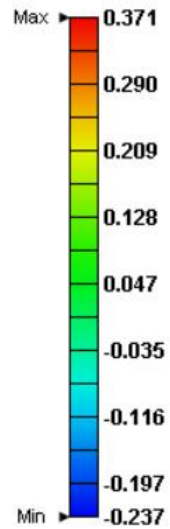
# Planarità della superficie di contatto



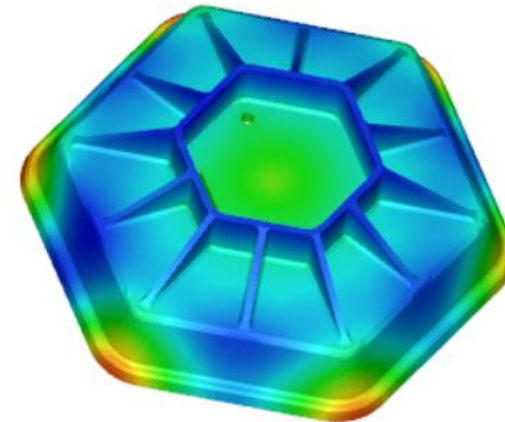
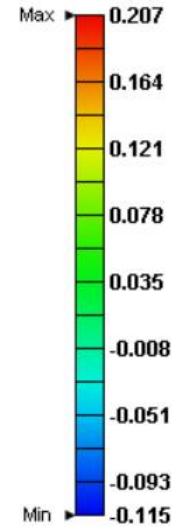
# Spostamento sugli spigoli



Warpage\_Y-Displacement  
[mm]

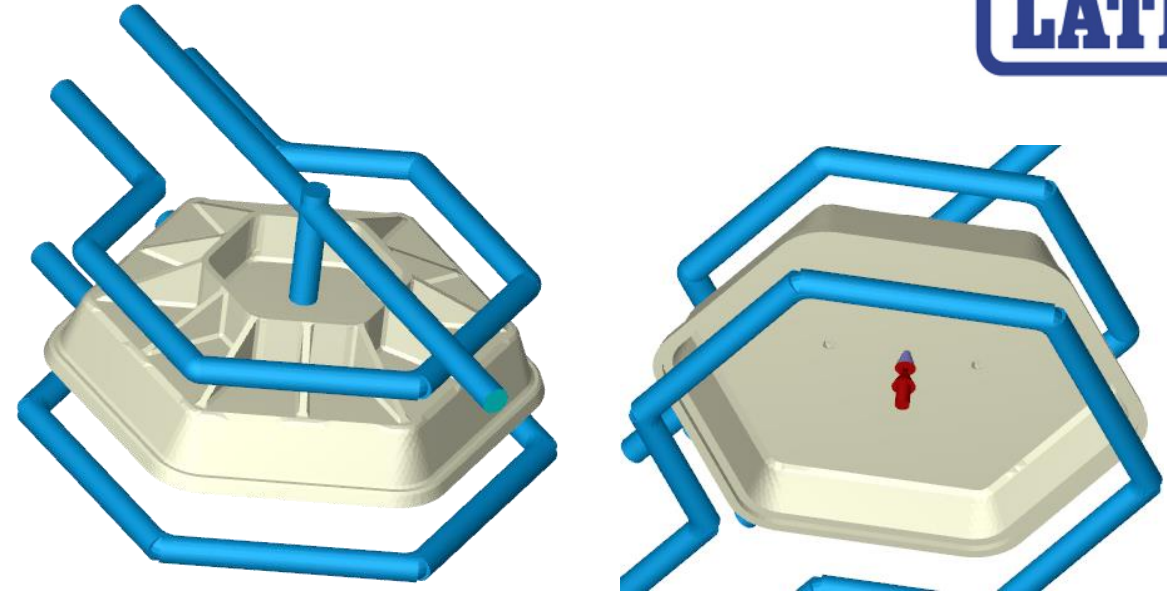


Warpage\_Y-Displacement  
[mm]

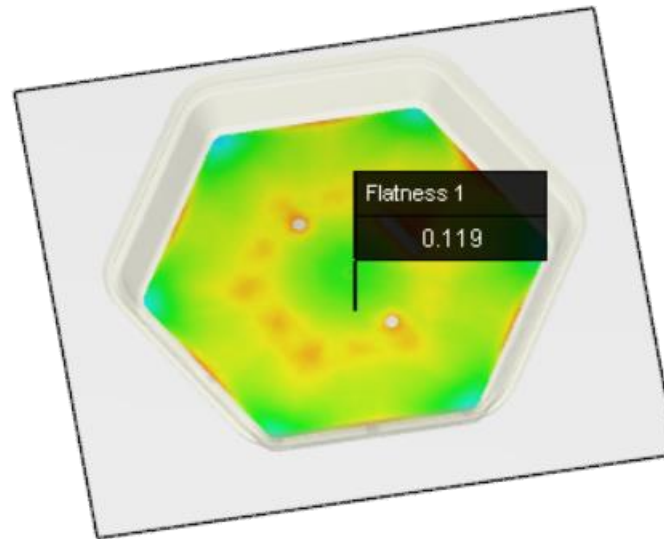
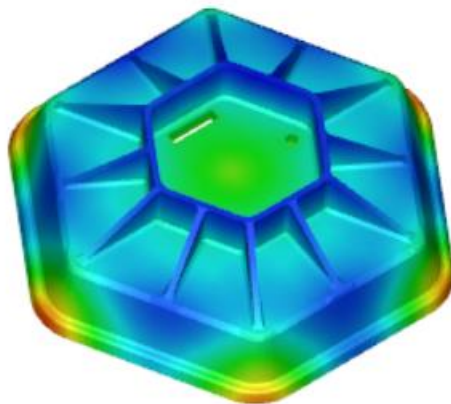
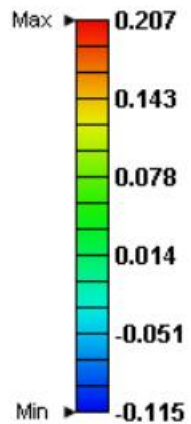


## Configurazione finale

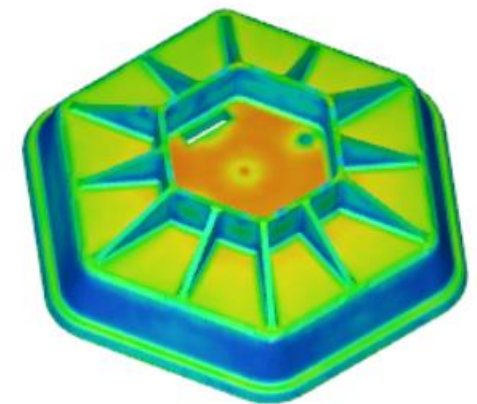
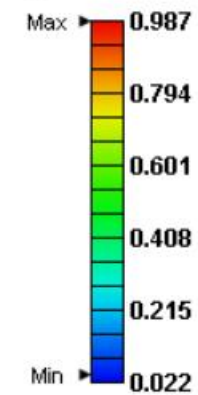
- Geometria modificata
- Sistema di raffreddamento specifico + fontanella
- Alimentazione centrale, lato LED



Warpage\_Y-Displacement  
[mm]

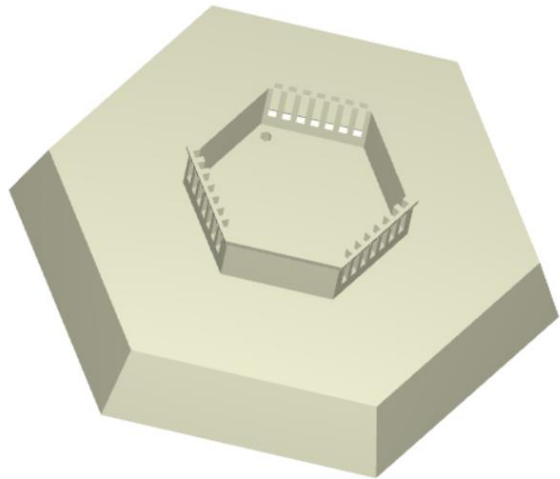


Filling\_Flake Orientation in Y Direction  
Time = 1.770 sec (EOF)  
[-]

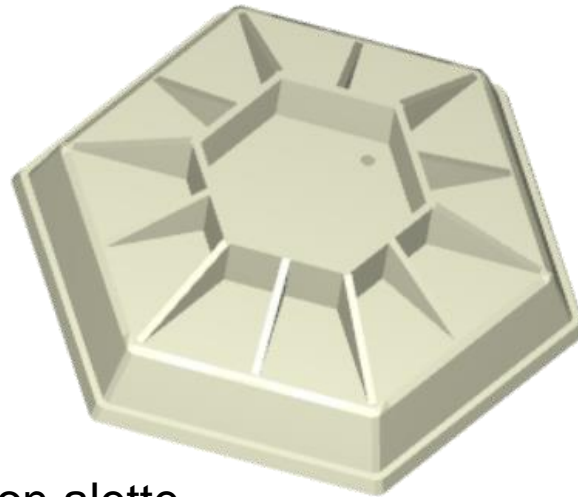




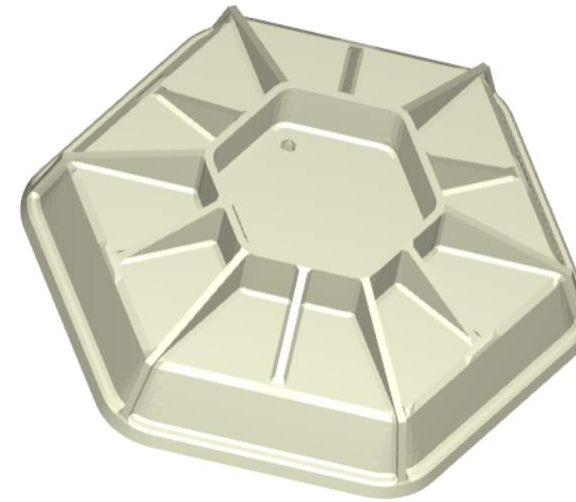
## Evoluzione della geometria



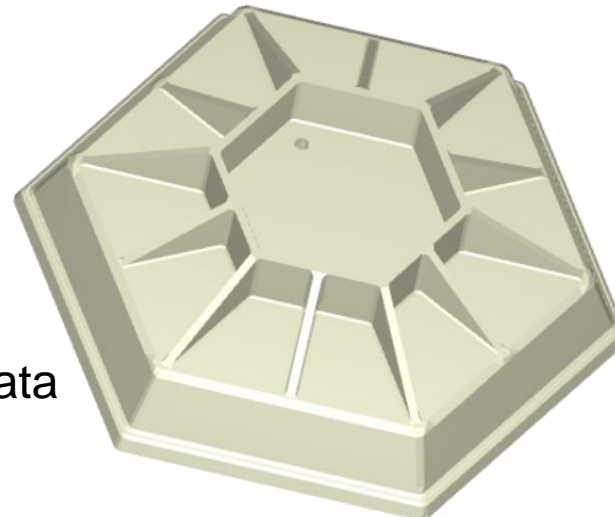
Design originale



Con alette



Con nervature

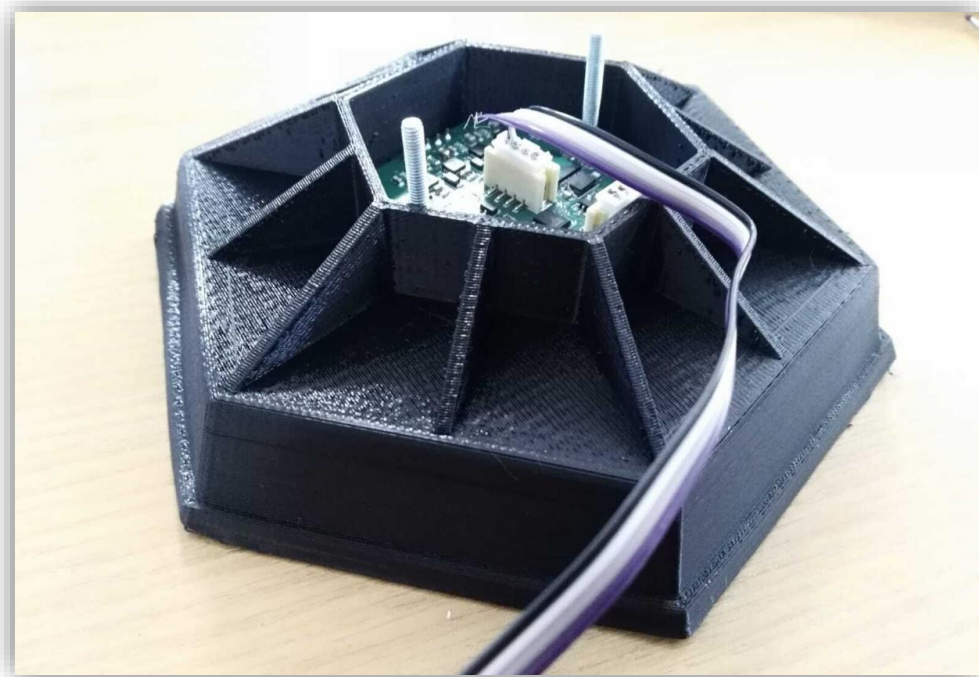


Base scaricata



Design finale

# Prototipazione



Stampato in 3D per verificare  
l'assemblaggio



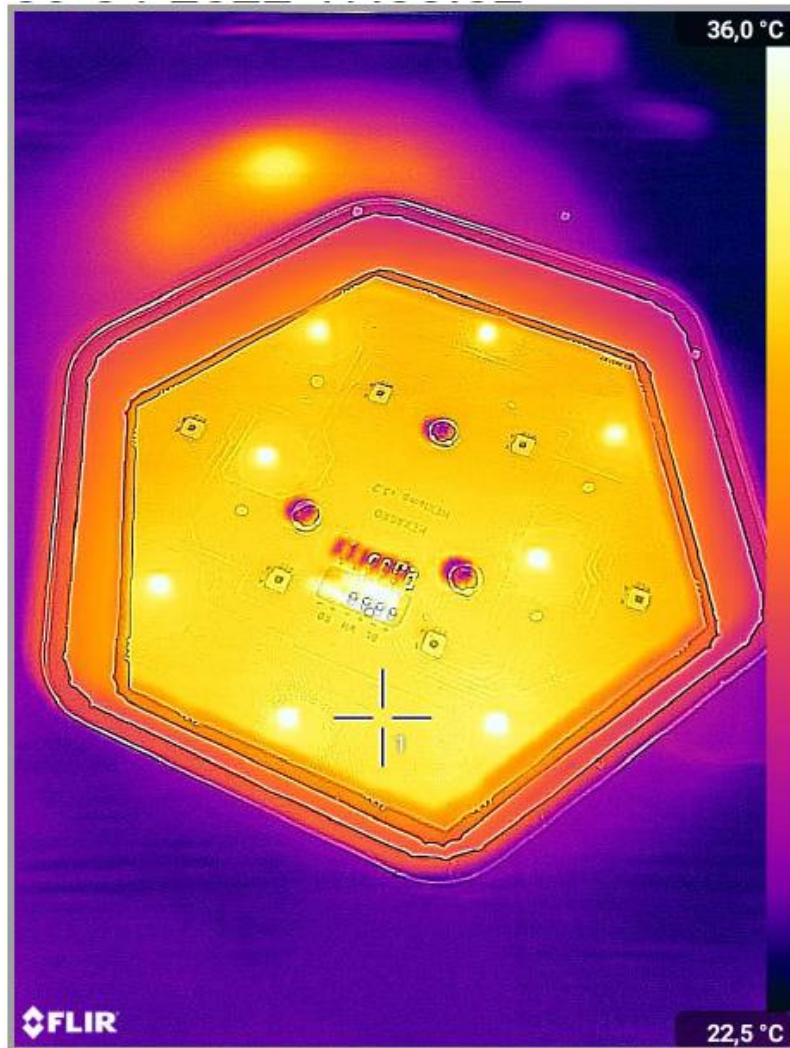
Prototipo ottenuto per lavorazione meccanica da  
pieno con la geometria definitiva per verificare lo  
scambio termico

## Verifica della dissipazione





# Verifica della dissipazione





# Produzione











Thank you



## HEADQUARTER

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