



## External Advisory Board meeting – Topic S2R-OC-IP1-01-2019/IP1/CCA.

### Modular tooling and parts manufacturing for composite car body

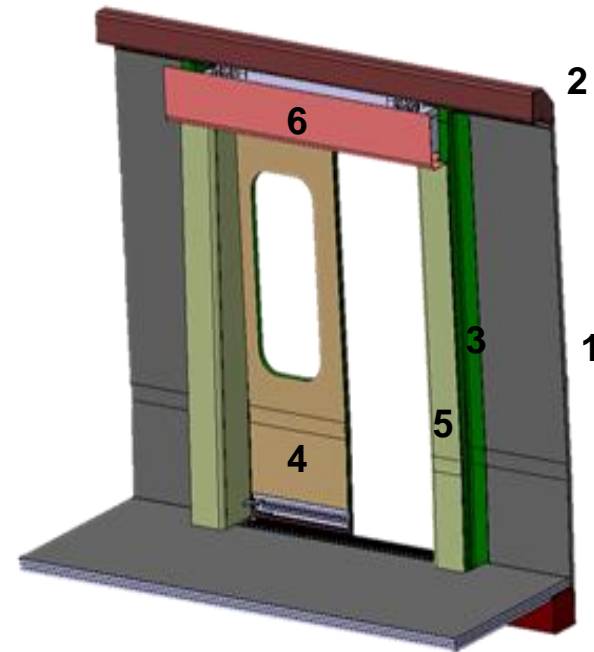
Project coordinator: Fundació Eurecat

Project duration: from 01/12/2019 to 28/02/2022 (27 months)



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|          | no. | description                       |
|----------|-----|-----------------------------------|
| Car Body | 1   | Sidewall                          |
|          | 2a  | Side Sill Floor                   |
|          | 2b  | Side Sill Roof                    |
|          | 3a  | Door pillar L                     |
| Doors    | 3b  | Door pillar R                     |
|          | 4a  | Door Leaf L                       |
| Interior | 4b  | Door Leaf R                       |
|          | 5   | Interior Panel Door<br>Pillar L/R |
|          | 6   | interior panel Top                |



# Modularity Concept

## Moulds "3A" and "3B" Door Pillar L+R

The mould design can be realized cost effectively by mould modularity with **one main mould** and **two changeable extensions**.

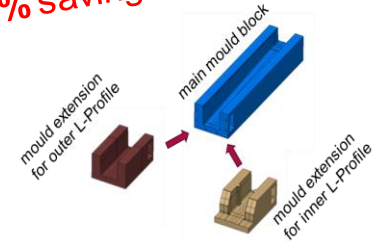
## Moulds "2A" side Sill Floor and "2B" Side Sill Roof

it is possible to manufacture both Side Sill Roof and Side Sill Floor parts with the same mould and changing some headblocks.

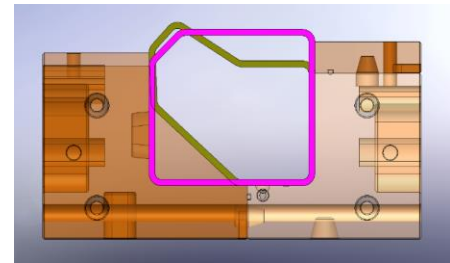
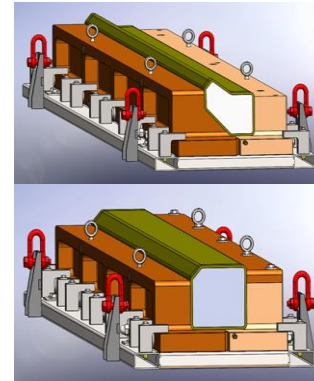
## Mould "1" Sidewall

Only one Sidewall is necessary to create the representative section of a wagon

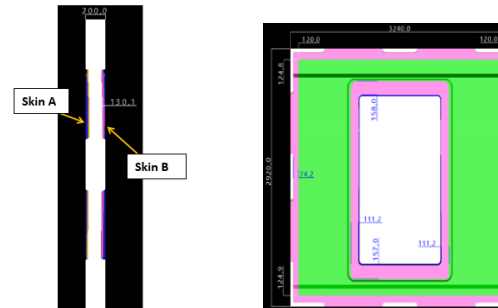
61% savings



16% savings



25% savings

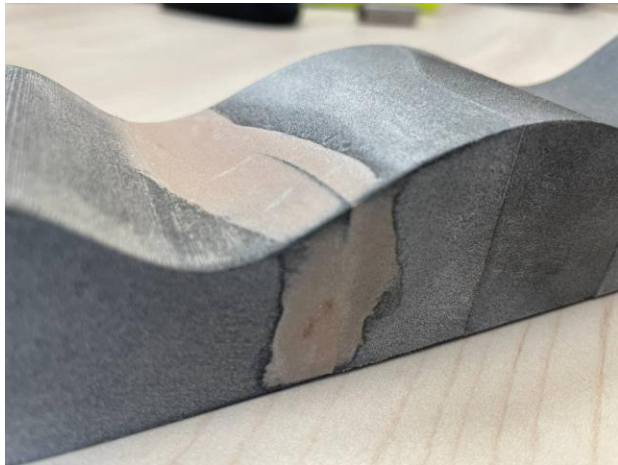


# 3D printed inserts



## Assembly

Mechanical union  
Resin leaks prevention



## Eliminate union mark

Use of putty  
Roughness evaluation



## Surface finishing and impermeability

Use of epoxy sprayer  
Roughness evaluation  
Moisture absorption evaluation

# Side sill manufacturing



## Small scale approach

Flow media election  
Resin inlets definition

## Compaction and Fvc control

Laminate sequence definition

## Vacuum levels in modular molds

Choice of global vacuum bag

## Conclusions

- **Use of modular tools** to produce different composite parts with the same mold by means of vacuum infusion processing **have been successfully demonstrated** by manufacturing the parts for the car body.
- **Experiments** on additive manufacturing have demonstrated the feasibility of providing a **3D printed mold** made of smaller elements, providing **good surface quality** after union and rework.
- **Manufacturing** of a singular part adapting **vacuum infusion process** to large **profile** with **3 good surface quality**

Thank you for your attention!



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