PART DEVELOPMENT FOR ENGINE SUPPORT ACCESSORIES FOR DIE CASTING PROCESS

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Abstract: This paper presents the development of an engine support accessories, for die casting process. On this part are mounted more parts of the engine depending of the type of the engine diesel or gasoline and dimension of it, 1 liter 1.2 liter 1.9 liter 2.4 liter etc.

1. INTRODUCTION

This part like all the parts of this category of supports is subjected to efforts and must withstand the maximum calculated stresses load with a safety coefficient added.

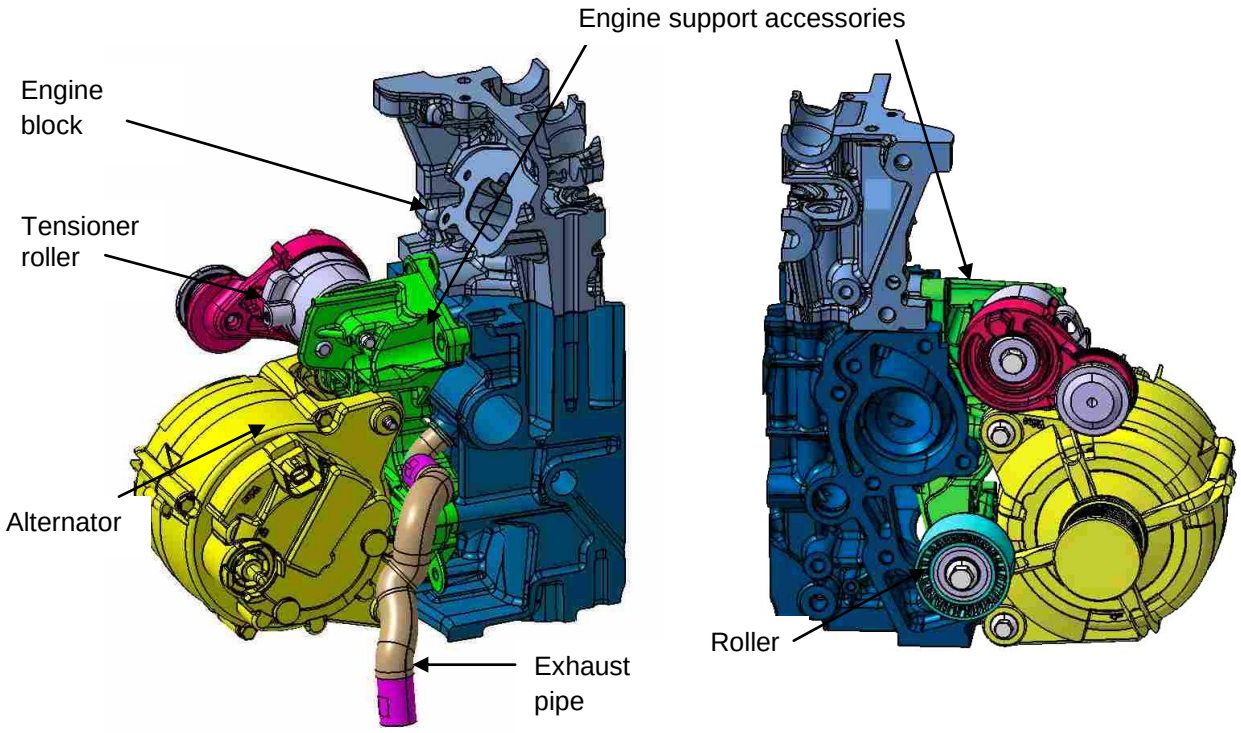

Figure 1.1 The engine support accessories

2. THE STEPS IN THE DEVELOPMENT OF THE PART FOR THE DIE CASTING PROCESS.

2.1 DEFINE THE PARTING LINE OF THE PART

In this case we started from a 3D model of the part that didn't have the geometry defined for the die casting process.

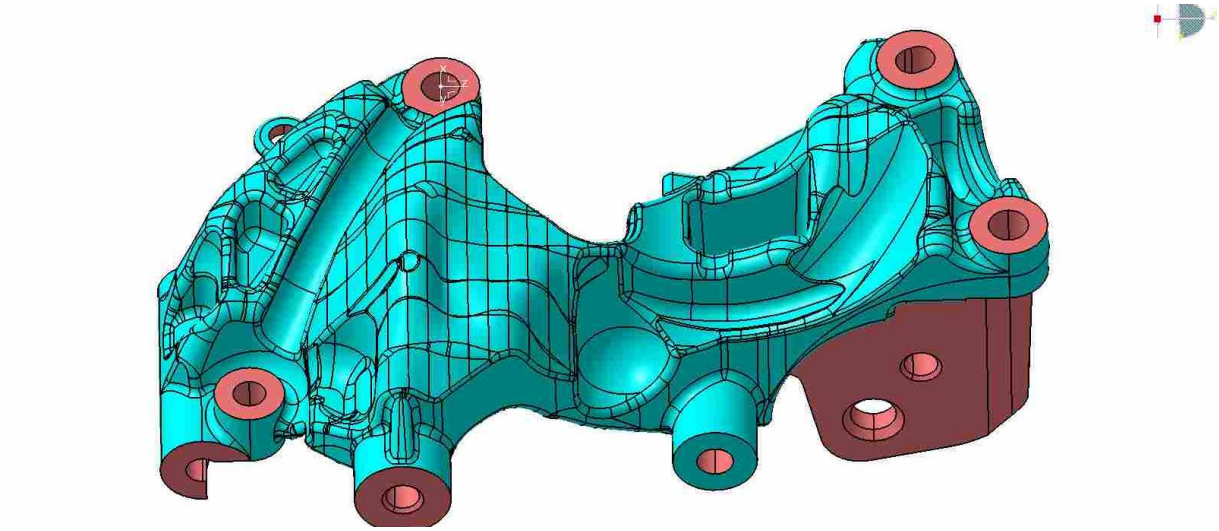

Figure 2.1 The engine support accessories undeveloped for die casting process

The die cast developer of the part in most cases must start from the 3D part received from a client, the part is machined and meats the resistance and functional requirements (Figure 2.1).

The part developer, designer must make the part castable.

The parting line must be defined first (Figure 2.3).

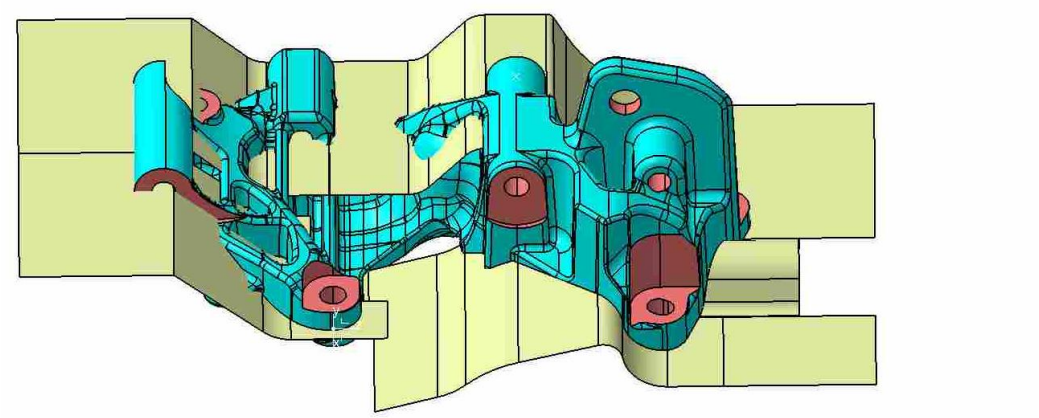

Figure 2.2 Original parting line of the engine support accessories undeveloped for die casting

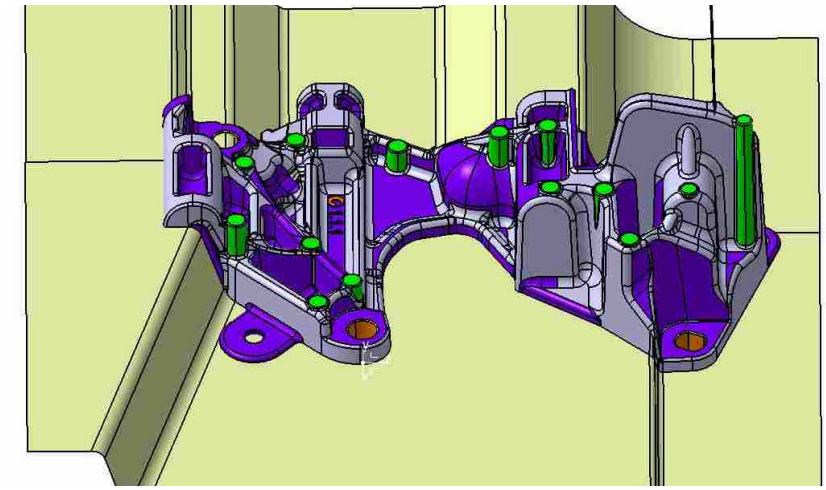

Figure 2.3 Developed parting line of the engine support accessories for die casting process

2.1 DEFINING THE MACHINING SURFACES AND MATERIAL TO BE ADDED FOR MACHINING

The next step is to define what surfaces we will be machined (marked in red) and what surfaces can be obtained from die casting process (Figure 2.4) without the need of machining fulfilling in the same time the functional drawing.

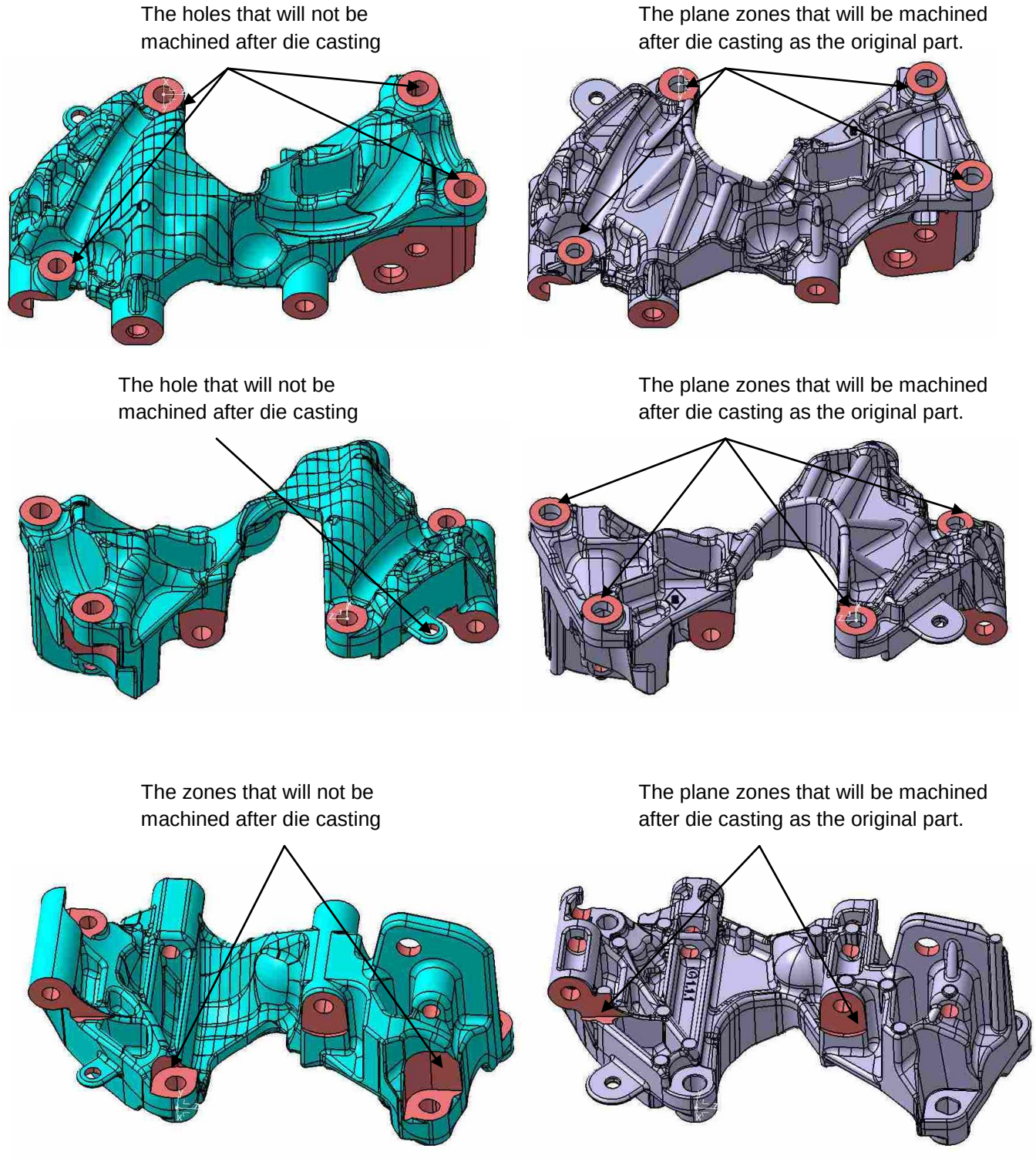

Figure 2.4 Original part left side and developed part for die casting right side

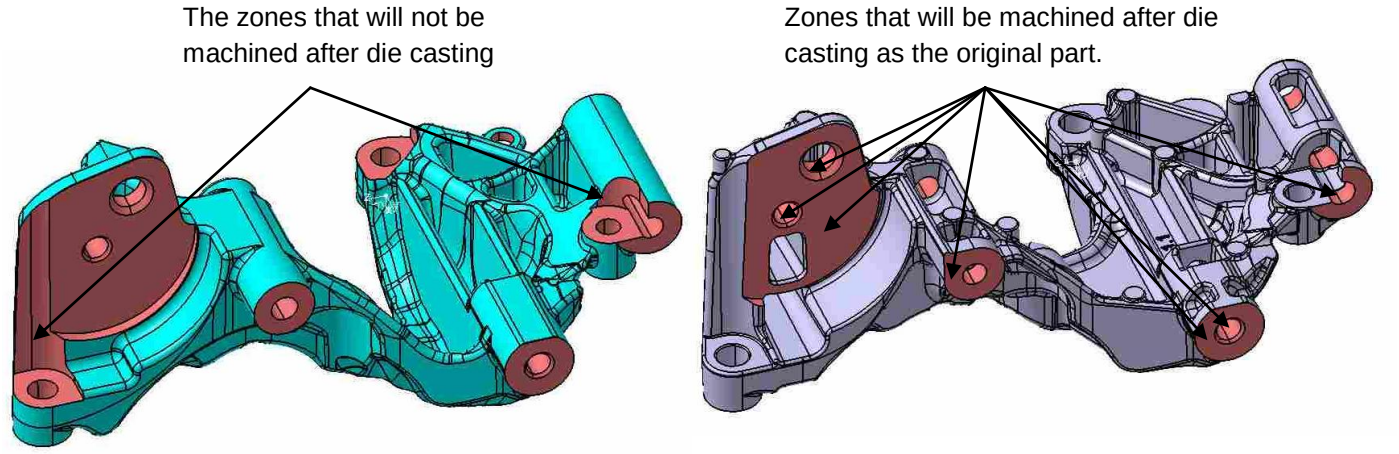

Figure 2.4 Original part left side and developed part for die casting right side

2.3 WALL THICKNESS ANALYSIS AND FLOW DIRECTION

The wall thickness is very important for the parts that will be obtained by die casting process. Because a thick zone (Figure 2.5) will give big problems in the solidification of the part, will solidify later than the rest of the part and will have a lot of shrinkage pores that is unwanted on a die casted part [].

It is very important for a die cast part to be built with the best geometry possible for the best flow (Figure 2.5). Because a part with a good flow will not entrap air when filling, resulting less porosity, a cleaner part. This will be better developed after firsts simulations.

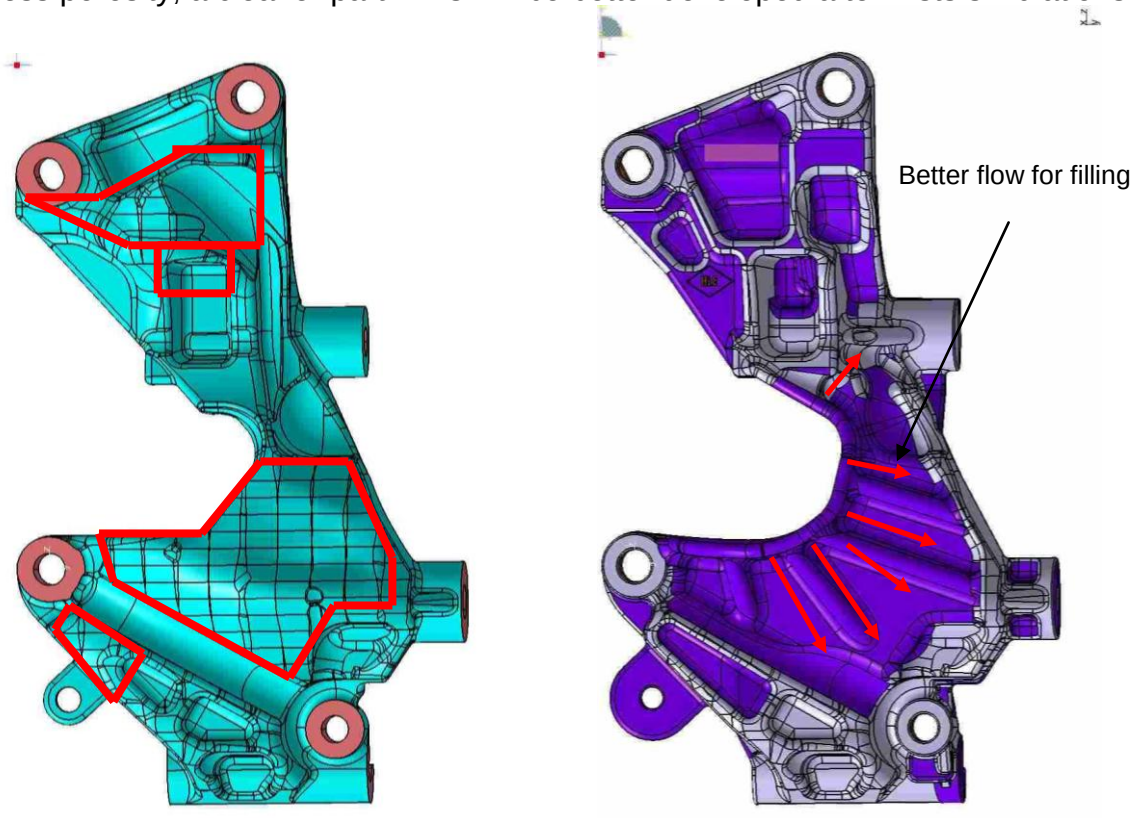

Figure 2.5 Marked in red zones that needed to be rebuilt for thinner walls and better flow (fix side)

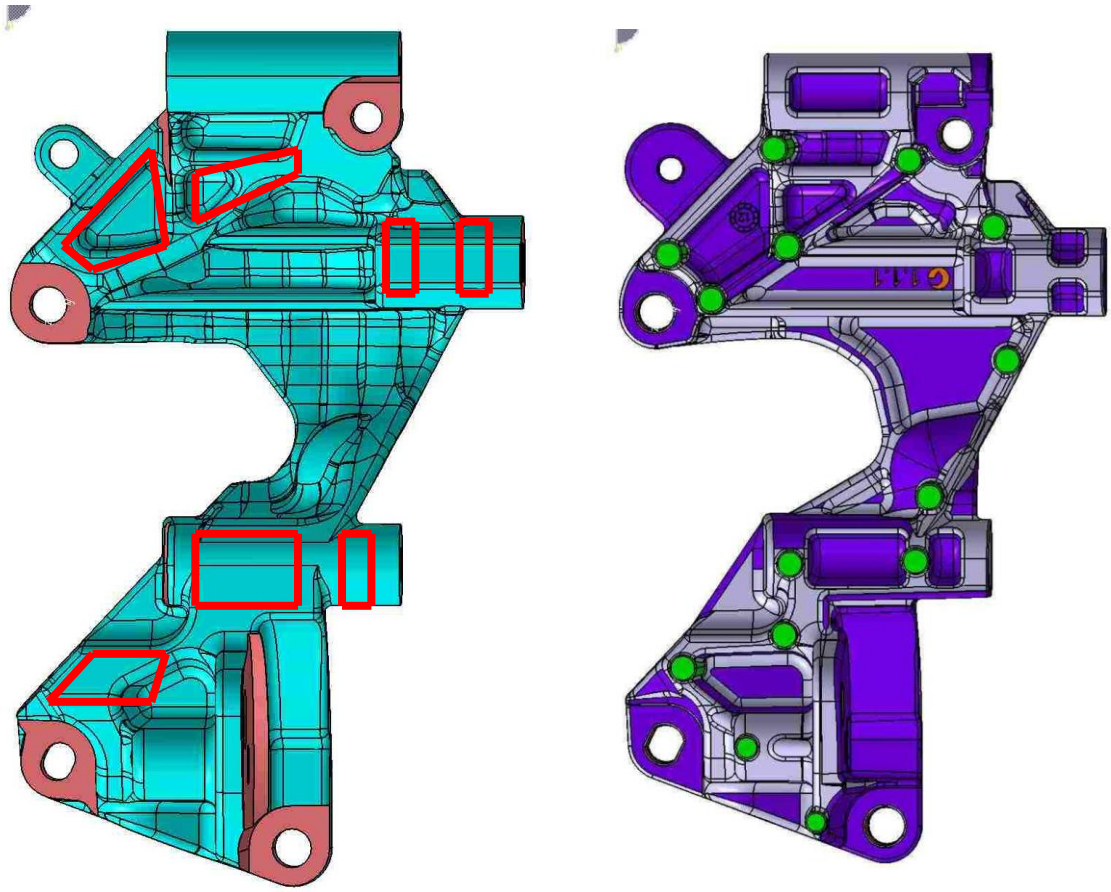

Figure 2.6 Marked in red zones that needed to be rebuilt for thinner walls and better flow (mobile side)

2.4 POSITIONING THE EJECTING PADS

As said in the comments of the figures 2.5 and 2.6 we must define the fix side and mobile side of the part. In most cases the mobile side is the side with the deepest zones that can retain the part in that side naturally without the help of an ejecting system on the fix side of the mold.

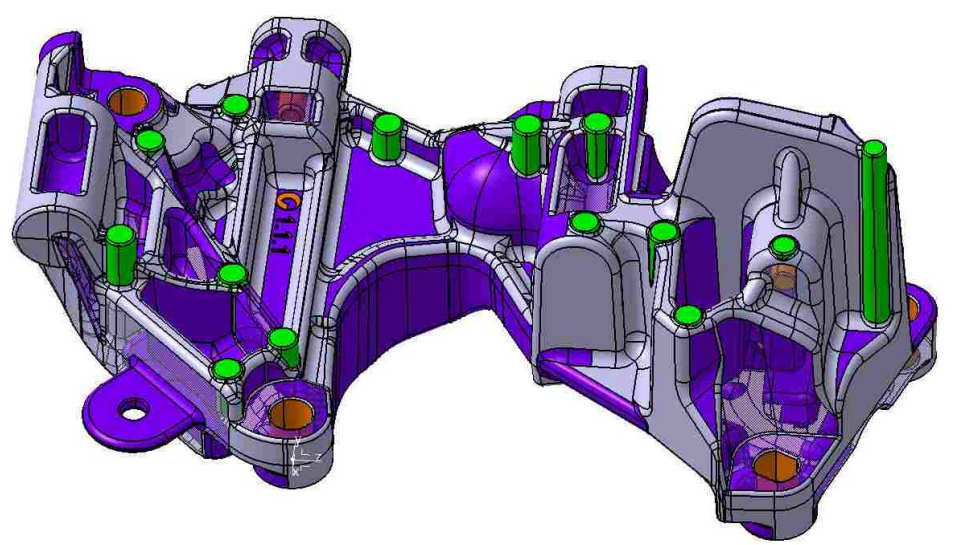

Figure 2.7 Mobile side of the engine support accessories with the ejecting pads (in green).

3. DEFINING THE INGATE AND OVER FLOWS

The zone where to position the ingate must be very careful picked. The zone must be preferable as plane as possible (Figure 3.1), like this the ingate will not introduce turbulence in the part, the material must enter tangent to a wall if possible and not perpendicular to one.

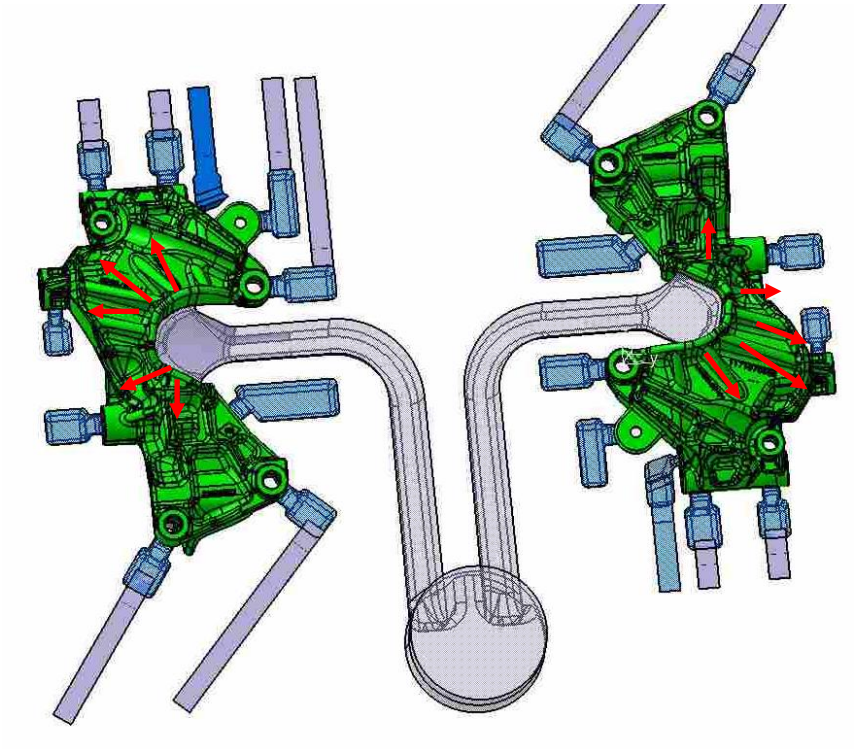

Figure 3.1 Mobile side of the engine support accessories with the ejecting pads (in green).

The over flows before the virtual filling simulation are positioned after the experience of the designer of the shot, and after the first filling simulation will be possible an exact positioning.

4. SIMULATION OF THE FILLING AND SOLIDIFICATION OF THE PART

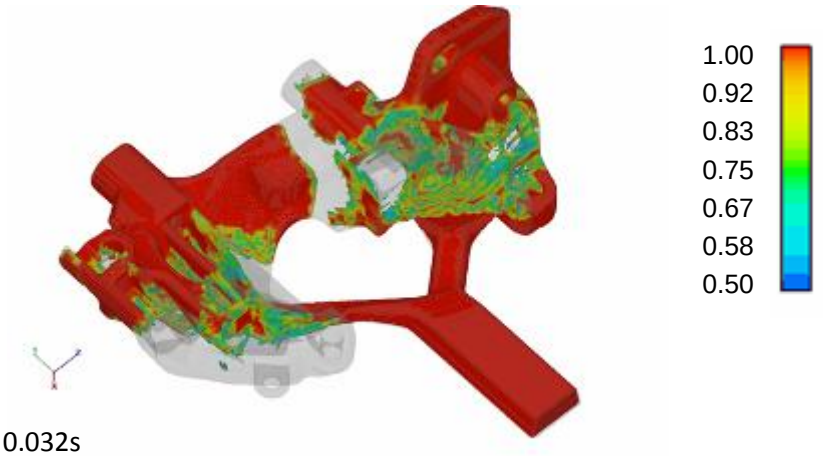

Figure 4.1 Filling simulation of the original part undeveloped for die casting processes

As we see in the figure above (Figure 4.1) the first simulation with the original part, undeveloped, with the ingate positioned as best the allowed the flow of the material is meeting in the middle of the part, zone where the part must stand the biggest efforts.

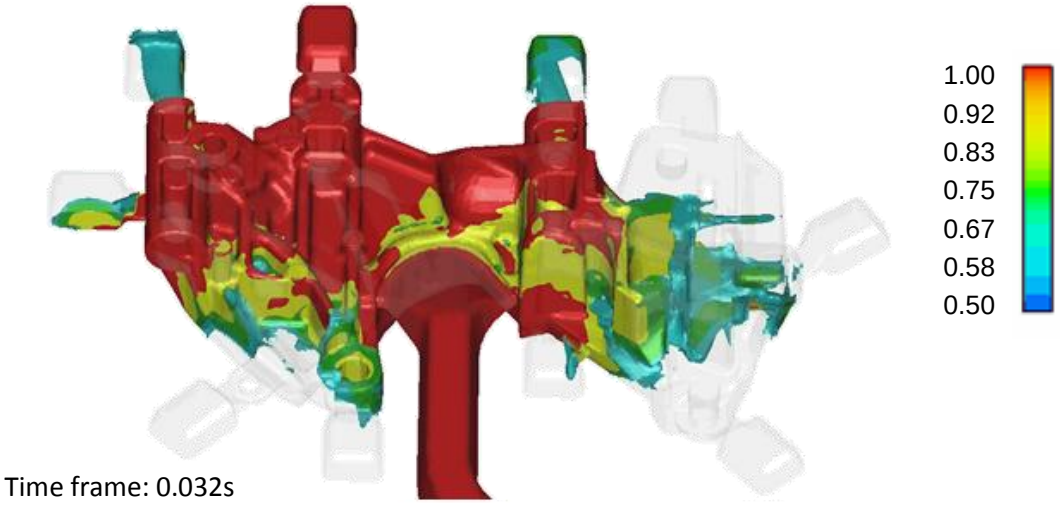

Figure 4.2 Filling simulation of the developed part for die casting processes

5. CORRECTIONS TO BE MADE TO THE PART, INGATE AND OVERFLOWS

As said before, after the firsts simulations we can see what changes to make to the part for the best filling possible to entrap the minor quantity of air, and to position the overflows in that way to get out the entrapped air.

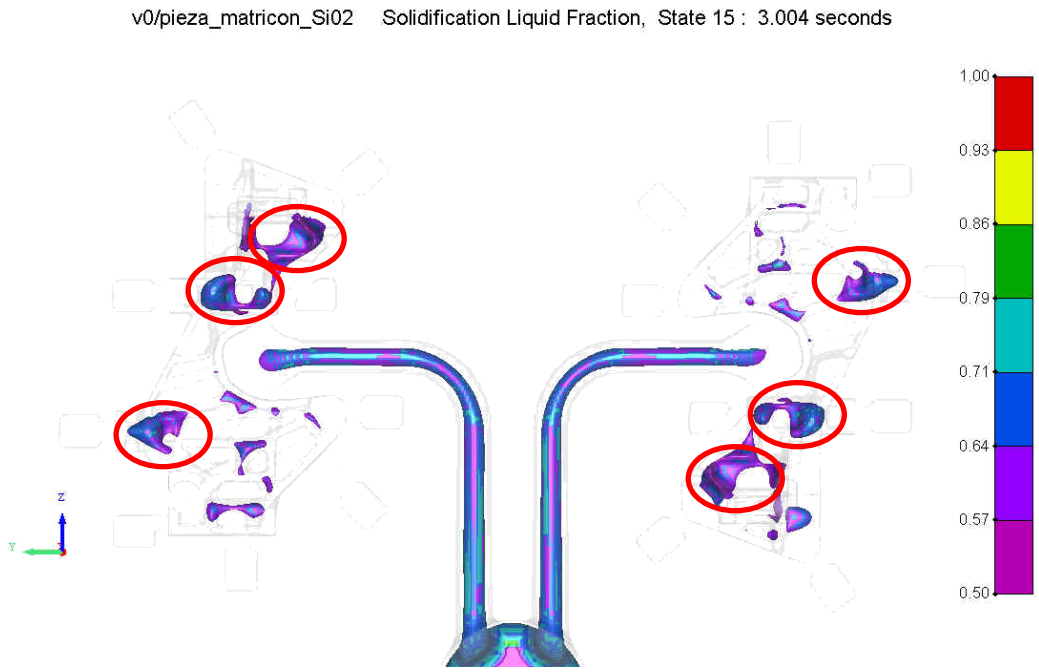

Figure 5.1 Solidification simulation of the developed part for die casting processes

The solidification shows zones with poor solidification at 3s that must be reduced.

As shown in the figure below (Figure 5.2) the part needs to be modified in the red marked zones, for a better filling, more draft bigger radiuses.

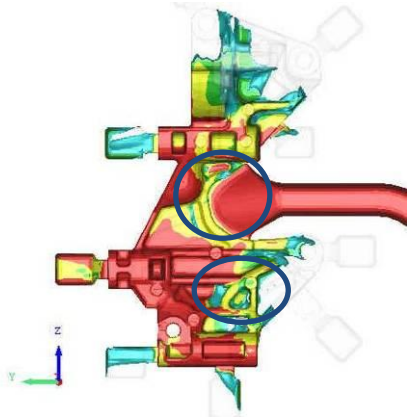

Figure 5.2 Filling simulation of the developed part for die casting processes

In the figure below (Figure 5.3) it can be seen what overflows need to be moved and where to introduce new one.

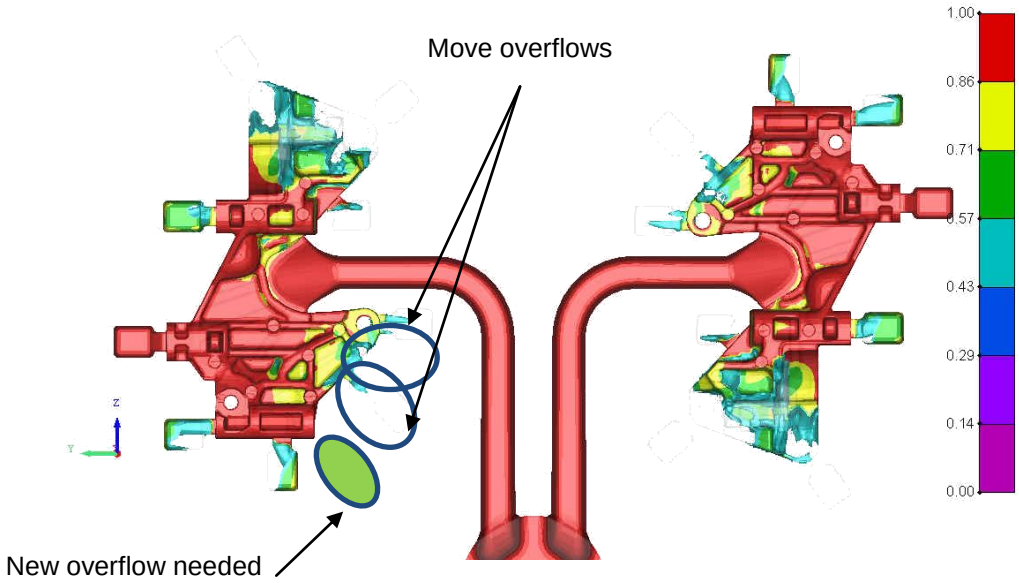

Figure 5.3 Filling simulation of the developed part for die casting processes

6. CONCLUSIONS

Today in the development of the part a very important role is played by the design and simulation software, but is equal important the interpretation of the simulations to be a correct one to have at the firsts tryouts with the real mold the best results.

References:

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