# Publishable summary

## *"FEATURE-BASED DESIGN AND MODELLING FOR INJECTION-MOLDING OPTIMIZATION"*

des·mold

**Project incentive:** During the last years, the production of plastic parts has moved from highly standardized moulds to more customized demand with small batch production. Moreover, injection companies are handling a strong pressure to deliver in short time high quality plastic pieces. In this context, and in order to negotiate with this harsh environment, have been considered to develop an intelligent knowledge-based system called Des-MOLD.

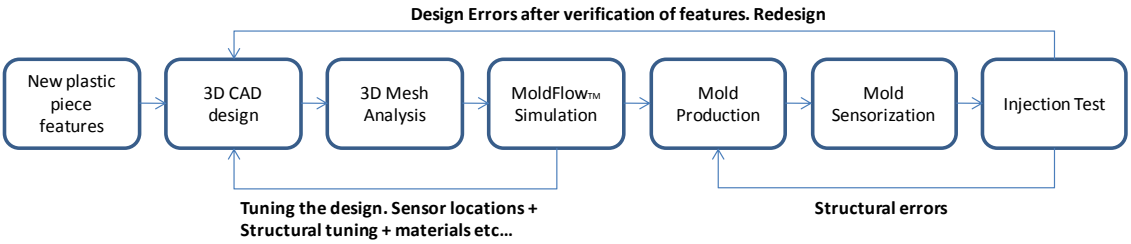
**Objective:** The main strategic objective of the **Des-MOLD project** is to **reduce the cost of injection-molding** production by developing and validating a set of knowledge-based tools specifically oriented to mould makers and plastic injection companies, which will reduce the need for mock-ups of moulds, and several try-and-error trials to calibrate process control variables.

**Approach:** The Des-MOLD project aims to build a new generation of intelligent knowledge-based systems for added-value injection molding design, empowering the tool making community and thermoplastic injection companies by means of considering the entire manufacturing chain of a new/modified mould design. Des-MOLD uses as a main source, past empirical industrial experiences and simulation data to optimize, at the design time, the geometries of the pieces and moulds according to the desired features, material properties, and to the expected process control variables; modelling this domain and supporting reasoning about features. Artificial intelligence techniques such as case-based reasoning and computational argumentation will permit both the inference of quantitative and qualitative information based on a large variety of empirical data and the justification of each decision.

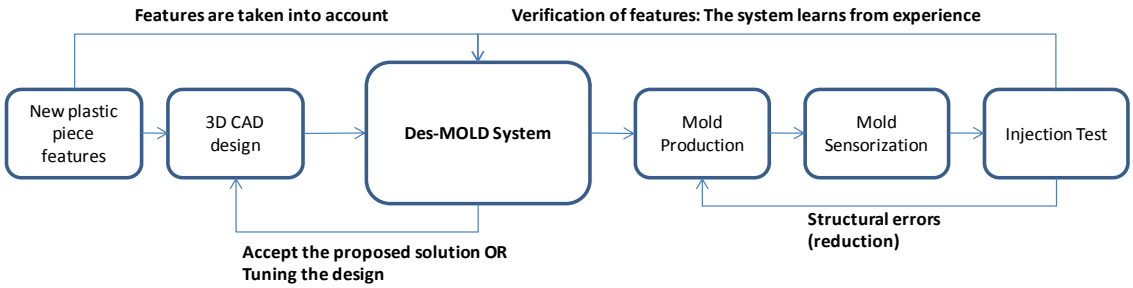
Des-MOLD is envisaged as a multidisciplinary collaborative environment for problem solving inter-company / intra-company for designing injection parts and moulds. The next figure compares the classical vision a) with respect to this new one b).

- Des-MOLD allows from the early stages of the design life to manage and share engineering knowledge and data throughout the entire development process;
- Des-MOLD provides recommendations as to possible solutions while also keeping track of the discussions and decisions taken.

- a) Current/traditional process:




- b) Des-MOLD process:




**Work Performed and Results Achieved in the project:**

Now that Des-Mold project has finished, we have achieved all the different objectives we have on mind in the beginning of the project, being some of them better that we expected

The main objectives achieved in the project are:

- **Development of effective structural feature-based modelling software for moulding optimization (DesMOLD platform):** It has been designed, implemented and deployment a software tool capable of suggesting alternative geometries for moulds and pieces or alternative materials in order to satisfy the desired structural features. This tool can also suggest the utilization of different types of gates in order to inject a mould or different parameters of the injection machine with the objective of having the best injection piece.

- **Development of a software module for virtual sensorization of moulds and structural features:** Once the geometry of a mould is set, it is necessary to sensorize the mold accordingly, in order to ensure the proper monitoring during the injection cycle. Then, we will establish a correlation between graphical features, structural features, defects and the final location of sensors. The software can predict the best allocation of the sensors in a mould to ensure that we can obtain the different parameters (temperature, pressure..) during the injection process.

- **Development of a software module for simplifying and matching CAD geometries.** We have created a software that facilitate the user in the process of simplification a pieces into a set of primitives. This software will allow the user to simplify the problem or problems he or she has so that once the problem is detected it will be easily and faster to solve.

- **Development of an argumentation module.** With the development of this module, users can insert the problems they have in their designs or pieces and other users or the system will suggest possible solution to the problems.

- **Development of an integrated decision support modelling tool for moulding injection optimization and planning:** Powerful decision support tool that links structural features of the final piece with the production process through the validation of the given geometry according to the needs.

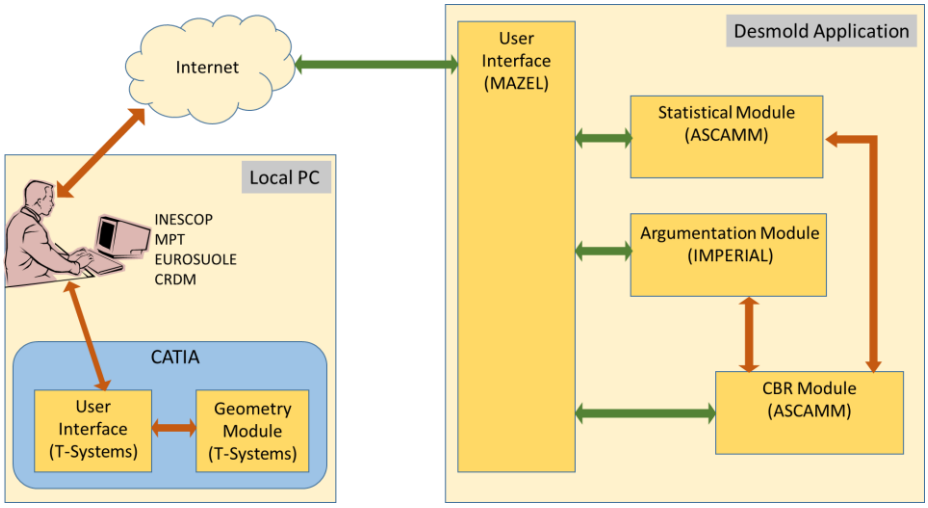



**Fig 1**. Des-MOLD modules

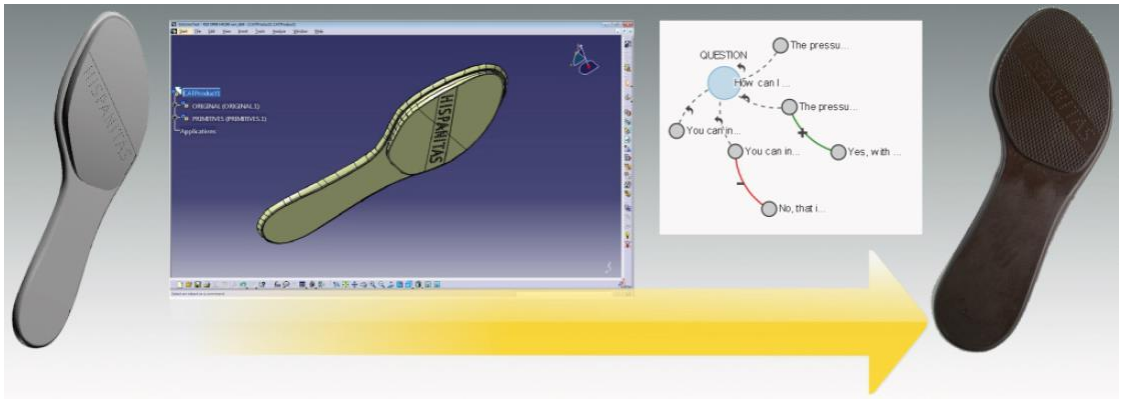



**Fig 2**. Des-MOLD process of having an insole

**Demonstrator, indicators of higher productivity (time/cost) and evaluation:** We have used two different demonstrators, footwear and motorcycle sector to validate the platform and the industrial impact. In this two sector we saw a reduction in time and money in the production of their respective peaces if they use Des-MOLD.

| Production time | | |
|---|---|---|
| Footwear sector | | |
| | **without Des-Mold system** | **Des-Mold system** |
| Mold design and production (h) | **23** | **12** |
| Injection Test (h) | **2** | **0.8** |
| Tuning the design (h) | **2** | **1.25** |
| Structural errors (h) | **1 or 2** | **---** |
| Design errors after verification of features. Redesign (h) | **From 2 to 8** | **0.5** |

**Table 1**. Comparison of time classical vs. Des-MOLD

The proper use of Des-MOLD system will imply the reduction of set up time in some cases at least 50%, cost reduction of 20%, reduction of scraps with a rejection ratio cut by a factor of two, and an overall increase of productivity of at least 15%. These factors will have a strategic effect on the sustainability of the European plastics industry competitiveness.

The Des-MOLD Consortium brings together a wealth of expertise and resources within the areas of injection molding industry, ICT tools for geometry treatment, intelligent decision support system, and software systems implementation. SME play a leading role in the project and contribute 68% of the total effort.

More information at: www.desmold.eu

List of participants:

| Participant Nº | Participant name | Short name | Country |
|---|---|---|---|
| 1 | EURECAT Technology Center | EURECAT | Spain |
| 2 | PLASTIASITE SA | PLASTIA | Spain |
| 3 | T-SYSTEMS ITC IBERICA SA | T-SYSTEMS | Spain |
| 4 | IMPERIAL COLLEGE OF SCIENCE, TECHNOLOGY AND MEDICINE | IMPERIAL | United Kingdom |
| 5 | MAZEL GMBH | MAZEL | Germany |
| 6 | INSTITUTO TECNOLOGICO DEL CALZADO Y CONEXAS | INESCOP | Spain |
| 7 | MPT PLASTICA SRL | MPT | Italy |
| 8 | EUROSUOLE SPA | EUROSUOLE | Italy |
| 9 | CRDM LIMITED | CRDM | United Kingdom |

Contact Person: Liceth Rebolledo (Project Coordinator)
liceth.rebolledo@eurecat.org
**Eurecat Centre Tecnologic de Catalunya,** Parc Tecnològic del Vallès, Av. Universitat Autònoma, 23**,** 08290 – Cerdanyola del Vallès (Barcelona) – Spain**, Tel:** +34 935 944 700 http://eurecat.org/es/