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# Design optimisation

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## Abstract

EFJM is company specializing in sealing and damping solutions for space applications (seals for Safran, dampers "flight qualified" for Airbus Defense & Space). The devices are often complex, they contain several metal elements (inserts) which are linked with rubber parts. These space applications necessarily lead to levels of accuracy that normal transformation technologies do not enable. Especially, the chains odds of the most efficient methods like hot molding, lead to accumulation of unacceptable tolerances. This is especially the machining tolerances for the inserts and the molds, tolerances required for positioning of the inserts in the mold, withdrawals after molding and the thermal expansion due to the environment.

EFJM follows many internal researches of manufacturing accuracy for many years:

- Positioning:

Example of an innovative process: the position error is eliminated by using a single insert; the final geometry of each metal element is obtained in the finish machining. This technique allows achieving levels of accuracy that previously unobtainable. This technique is co- patented with Airbus Defense & Space.

- Withdrawal:

Analysis of withdrawal (measure, theoretical calculation, digital simulation) was carried out for define its effect on the deformation, the mechanical behavior and the final operation.

From these results, we can propose the optimization of the concepts by the choice of the nature of elastomers, the precise dimensioning of the functional elements, the design of the limits of ruptures and the weights of inserts.

- Thermal expansion:

To insure a smooth operation and avoid the wear due to the additional frictional stress, EFJM innovates with a system of proportional compensation. An intelligent system allows adjusting the position of the functional party compared to friction face in direct proportion to the expansion of the functional party.

**Keywords:** accuracy, intelligent system

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