

Coupling tool to assist design and engineering of mold temperature control systems by topology optimization and hybrid fabrication

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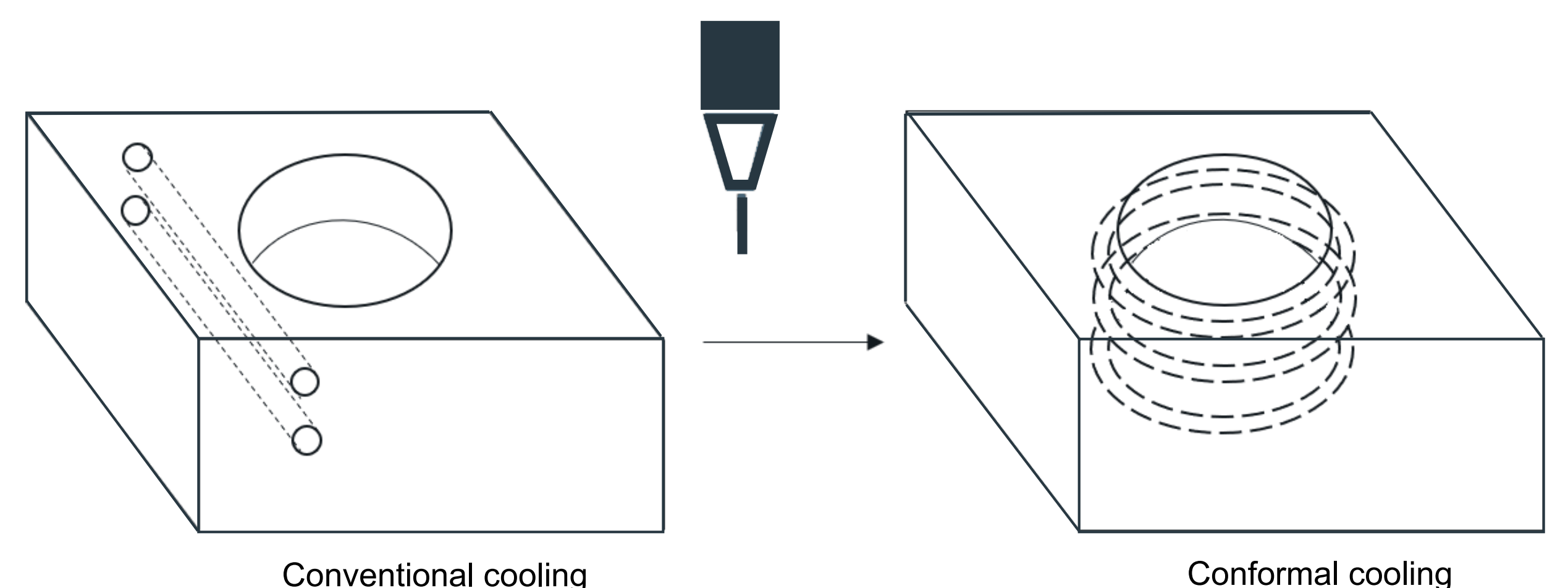
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Aims and goals

Temperature control systems in injection molding are detrimental for part quality and productivity. The numerical model under development intends to assist the design of enhanced temperature control strategies, taking advantage of additive manufacturing, leading to the production of hybrid molds.

Search for high quality plastics
+
Need to reduce production time

Investigate additive manufacturing as a solution to produce injection molding tools.



There is still a lack of a common methodology to assist the design of this new temperature control strategies, so new design rules will be investigated to establish the foundation for the numerical tool under development.

Methodology

Design of the injection molding process

- ∴ Simulation of the entire process.

Thermo-mechanical model

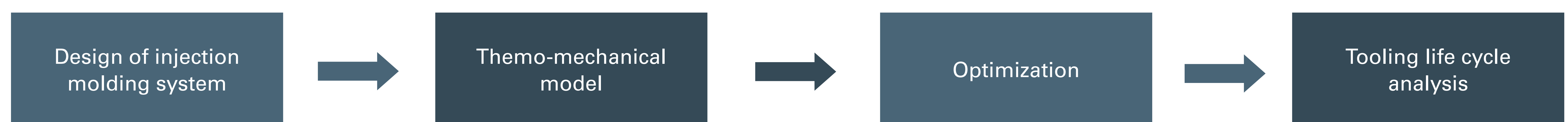
- ∴ Assessment of the relationships between process parameters;
- ∴ Assessment of mold structural data;
- ∴ Establishment of the overall process dynamics.

Optimization

- ∴ Determine the objective function, parameters, optimization variable(s);
- ∴ Selection of the most appropriate optimization algorithm;
- ∴ Simulation.

Tooling life cycle analysis

- ∴ LCA of hybrid molds;
- ∴ LCA of conventional molds;
- ∴ Compare both LCA.



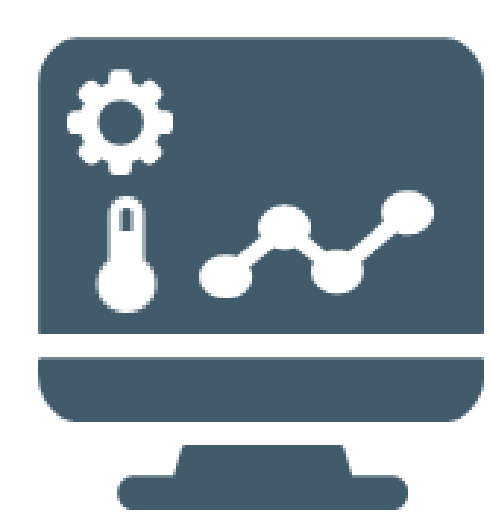
Future work

Although this PhD work has already been started with an extensive study on the current state of the art, there is still a long way to go to achieve its overall intended goal.



Gather expert knowledge

concerning the numerical simulation of the injection molding process



Develop a thermo-mechanical numerical model

capable of representing the cyclic nature of the injection molding process and its influence on the molding tool



Explore optimization techniques

as a means to generate enhanced temperature control strategies during the entire molding cycle

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