Indirect additive manufacturing of gradient composition object for drilling applications (GODRILL)

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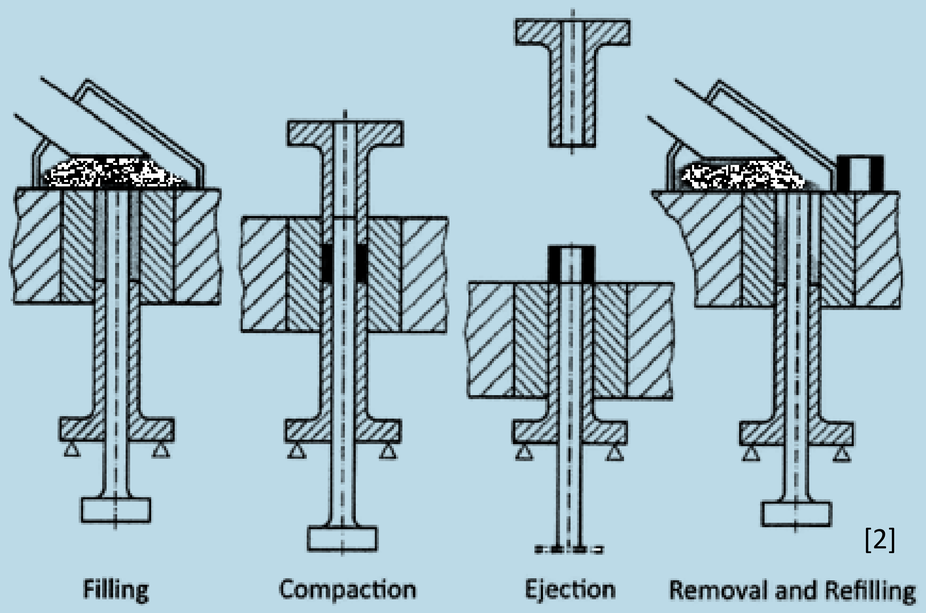
Context

In the extractive industry, particularly in mining, drilling, and energy production, diamond inserts must meet high standards of reliability and performance, which require the design of complex parts. Conventional shaping processes are based on cold compaction, which limits the geometry of the components and leads to expensive machining. In addition, cold compaction produces the shape in a single step, meaning that the entire part contains diamonds, resulting in limited optimization of the piece's composition.

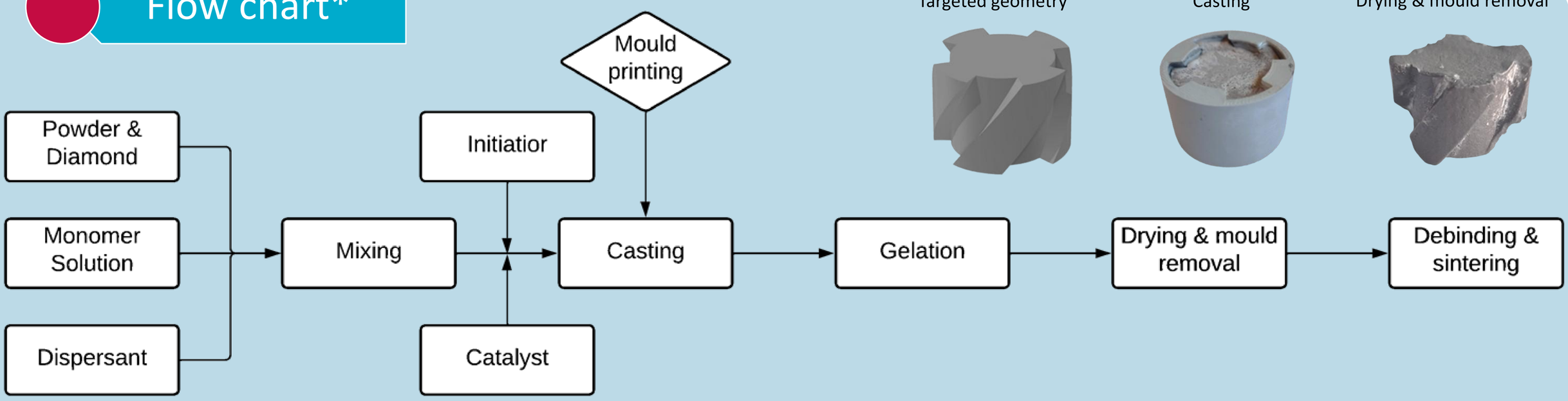
[1]



[2]

Near-net-shape forming processes, such as gel casting, represent a promising solution. This method is based on the in-situ polymerisation of an organic monomer binder, during which a macromolecular network forms to hold the powder particles together [3]. This project aims to develop cemented diamond–tungsten carbide parts with composition gradients using the gel casting process. Complex moulds are produced using 3D printing.

Flow chart*



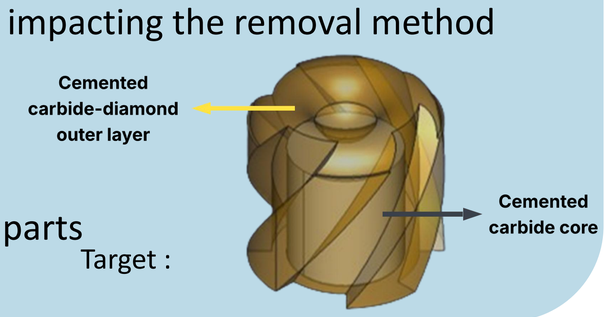
Examples from the previous project CODRILL :

*This flow chart corresponds to a standard procedure and may not fully correspond to the final flow chart for the project.

Research phases

- Development of castable formulations free from selective sedimentation of compounds
- Selection of polymer materials for mould production, impacting the removal method
- Study of drying, debinding, and sintering conditions
- Structural and functional characterisation of sintered parts

Target :



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References

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[2] B Poot. Travail de Fin d'études- Caractérisation d'outils diamantés. Université de Mons- Faculté Polytechnique, 06 2012.
[3] Li, Y., & Guo, Z. (2007). Gelcasting of WC–8wt % Co tungsten cemented carbide. International Journal Of Refractory Metals And Hard Materials, 26(5), 472-477. https://doi.org/10.1016/j.ijrmhm.2007.11.003

Acknowledgements

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