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Thoughts and Reflections on Industry 4.0:
Smart Die Casting - A Case Study

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Tuesday 23rd October – Magnesium Symposium 2018

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Outline

- Industry 4.0: Overview
- The Blue Book
- Smart Die Casting Approach

Industry 4.0 : Overview

- The definition for i4.0 was first announced in 2011 at the “Hannover Messe trade fair”
- The Germany Trade and Investment group (GTAI) has formed an i4.0 working and defines i4.0 as:

“A paradigm shift . . . made possible by technological advances which constitute a reversal of conventional production process logic. Simply put, this means that industrial production machinery no longer simply “processes” the product, but that the product communicates with the machinery to tell it exactly what to do”.

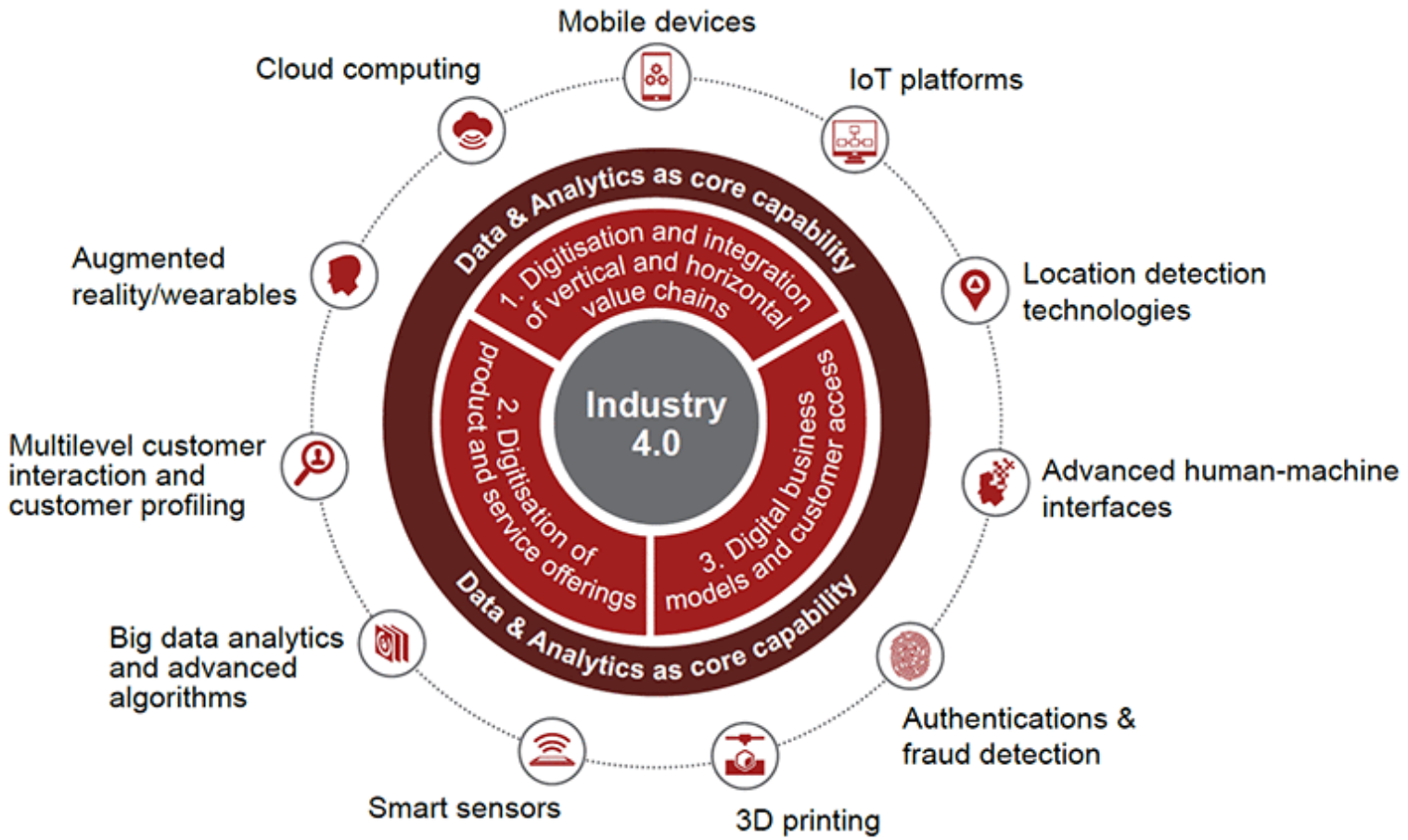
Motivation behind Industry 4.0's Phenomena

The main motivation behind adopting the i4.0 initiative for many manufactures is to overcome the following hurdles, but not limited to:

- ❑ High cost and shortage of talented labour,
- ❑ Short production cycle time with short lead-time to market,
- ❑ Small volume production.

Major i4.0 Technologies

Recently a set of new digital technologies have emerged that will help the industrial sector to improve its productivity rate and reduce cost, some of these technologies have been discussed in the blue book.



Source : (PWC, 2016)

The Blue Book

- Partnership
- Collaboration
- Review the state of the art in the area of Industry 4.0
- Industry engagement
- Societal contribution

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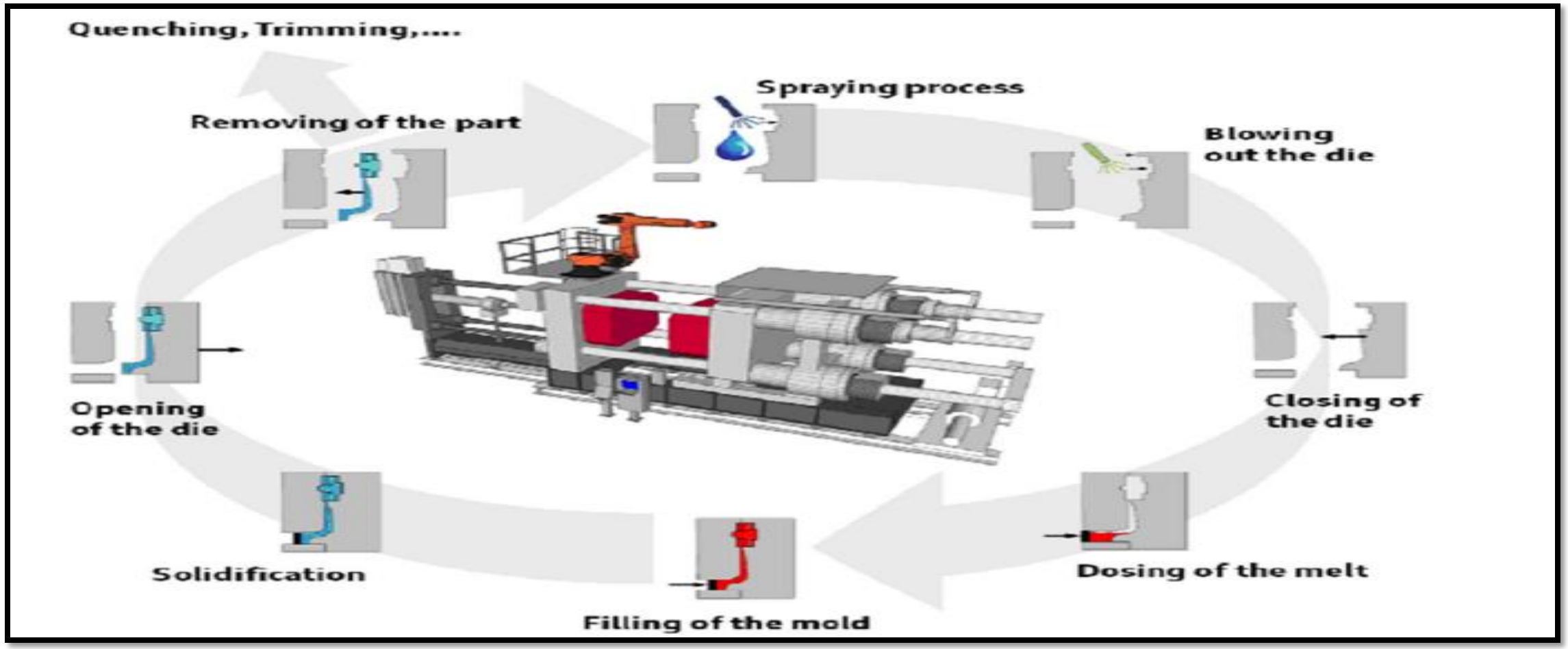
Why the blue book

The purpose of the book is to explore the importance of industry 4.0 as a digital enabler for the manufacturing sector – showcasing it as a strategic move, especially for automotive industry in terms of productivity, business growth and sustainability.

Smart Die Casting – Chapter 9- Page 80

- High Pressure Die Casting process.
- HDPC Process Observations.
- HDPC Process defects.
- Possible Solution (i.e. Real-time process control).
- Conclusion

Die Casting Process



Source: The HDPC Process Cycle (Bonollo *et al* 2015)

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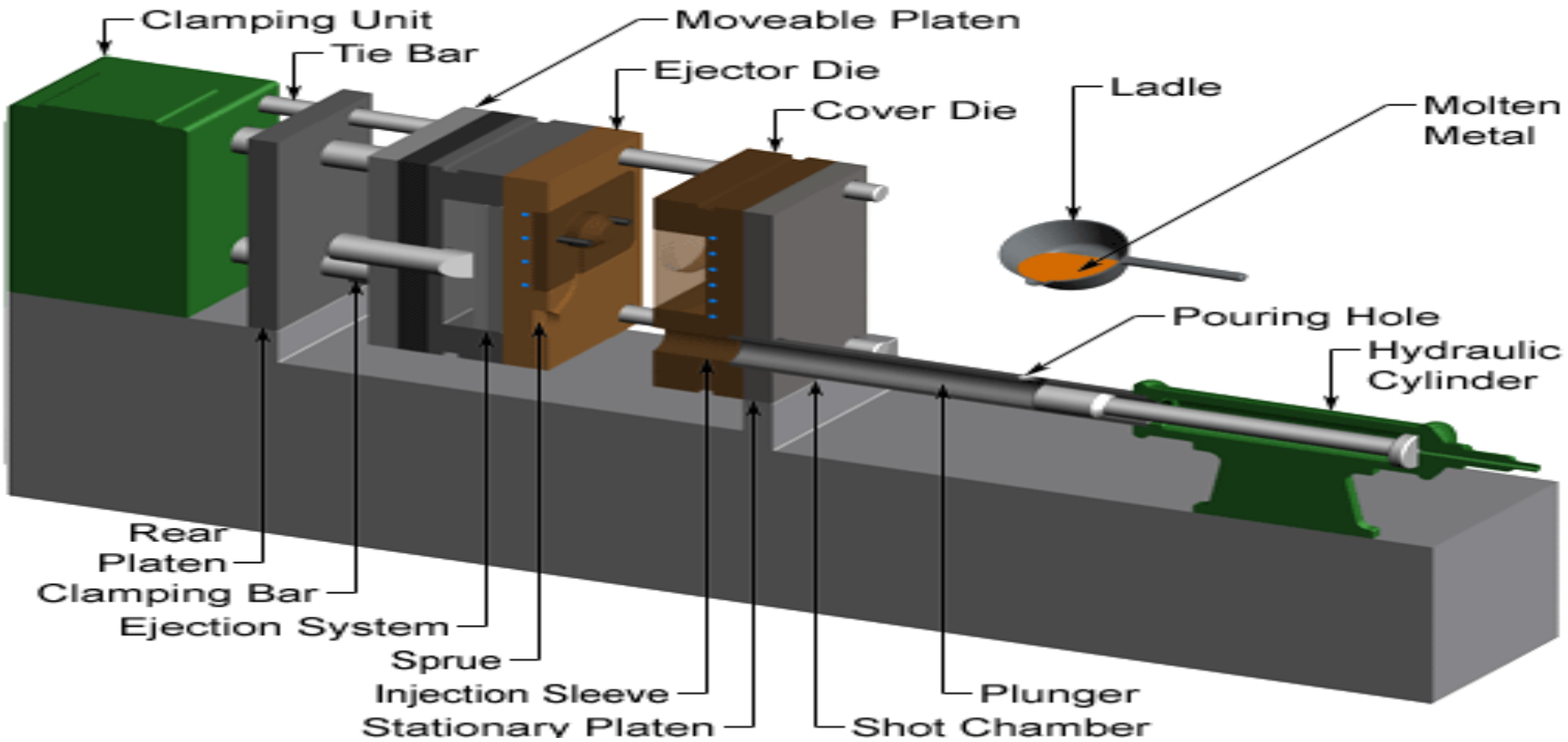
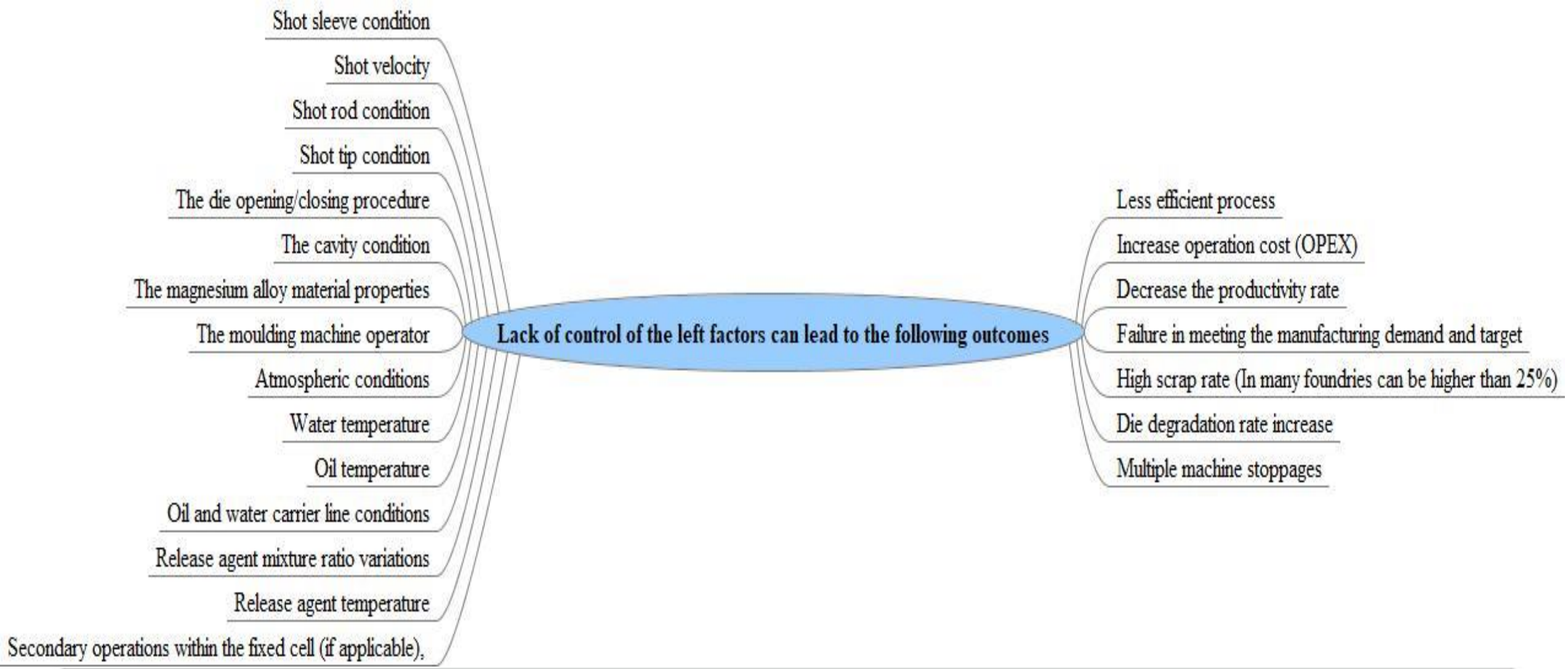
Die Casting Machine



Basic Cold Chamber Die Casting (Customoartnet, 2018)

Die Casting Process Parameters and Their Effects



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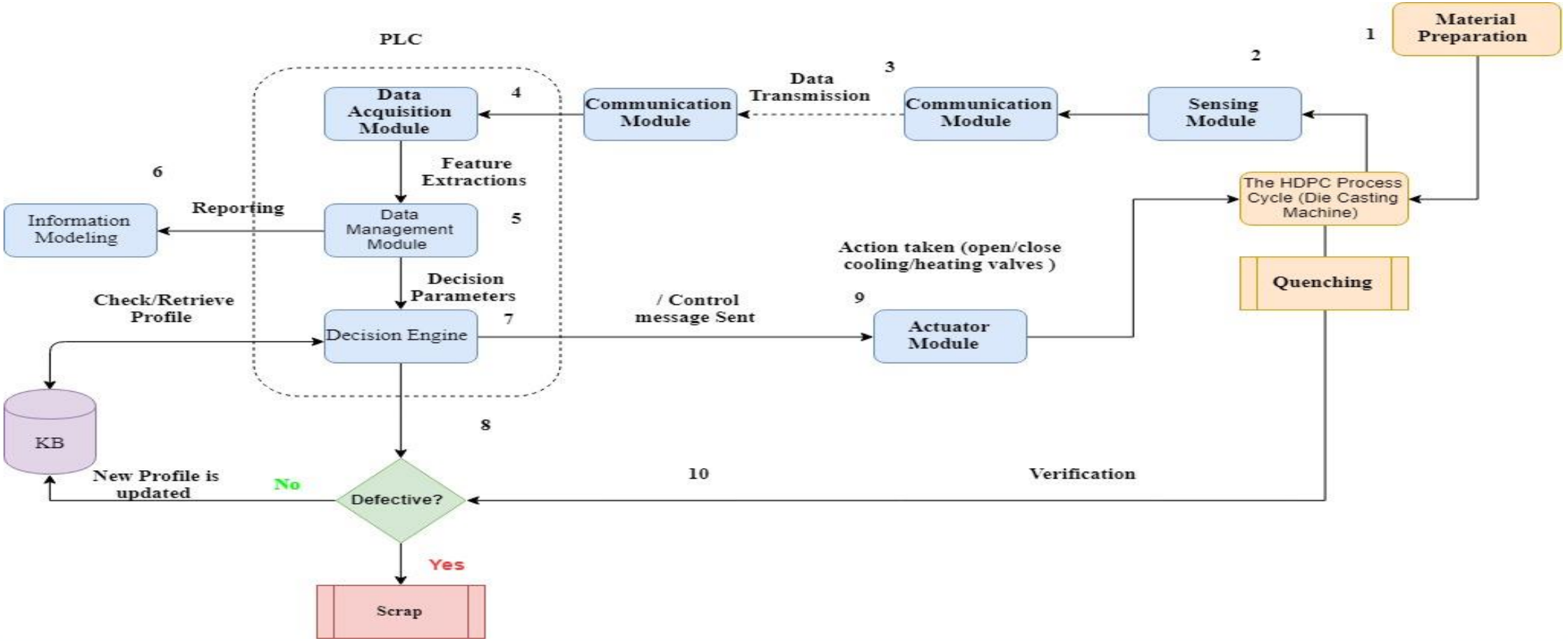
Smart Die Casting : The new approach



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Conclusion

1. The die-casting process is a complex engineering manufacturing process.

2. Understanding the process thoroughly is key to providing a suitable solution for any defect that may happen during the operation phase.

3. Tuning the plunger speed to allow molten metal filling the sprue at low speed and filling the mould at high speed is best practice.

4. Preventing the surrounding air from entering into the die by closing the gate quickly and increasing the pressure helps to reduce porosity defects.

5. Installing advanced sensors in the domain of the HPDC machine to monitor and control the HPDC process in real time is essential, in order to gain insights into process parameters for producing good quality cast parts.

6. Efficient heat distribution must be achieved within the cavity by controlling the amount of heating/cooling flow over the time of the die casting production phase.

7. Multidisciplinary research and development work is needed.

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