RealTimeCastSupport

Embedded real-time analysis of continuous casting for machine-supported quality optimisation

Webinar on 8th of September 2023

Conclusions and recommendations

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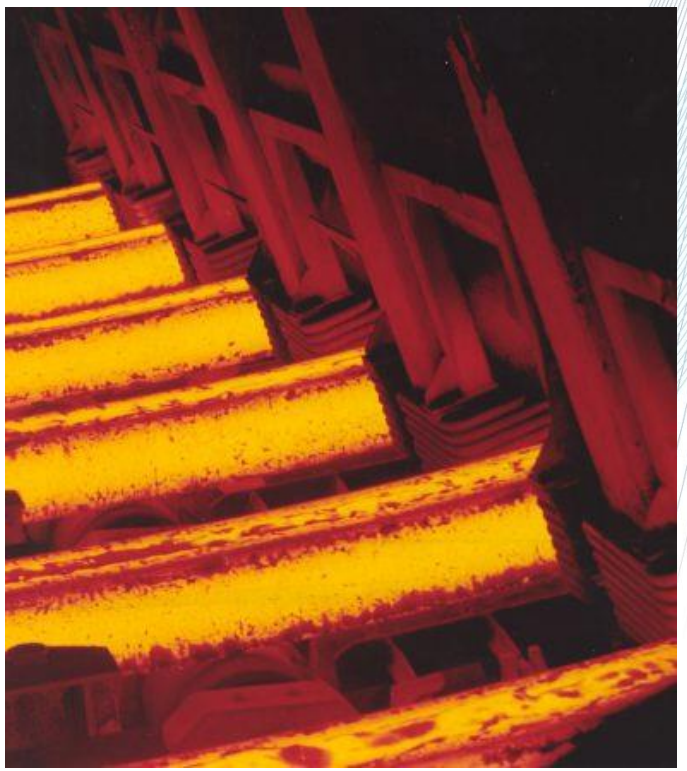

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Conclusions and recommendations

- Two important industrial partners are members of the consortium to ensure the implementation of the results in the industrial practice.
- The new measurement techniques were tested and verified in industrial plants to prepare the direct industrial exploitation.
- The approach for the thermal and flow state monitoring developed within the project is in particular promising to be used in many plants since it provides a new level of transparency of the crucial conditions in the mould.
- The digital twin of the casting machine was set up with already applied CFD models. This implementation utilises well known knowledge aiming at deeper insights of the CC process and is applicable and transferable for other steel producers. Due to the close link of the digital twin to the industrial measurements, the model represents the industrial CC machines in detail.
- The approach to establish a real-time support system is transferable to other steel plants. The findings and experiences using Big Data technologies to improve industrial data exploitation for a typical process step of steel production provide benefits even beyond continuous casting plants. This is a considerable step towards digitalisation of CC machines.

Roadmap (based on Dissemination project VALCRA) 1/5

› **Numerical Modelling**

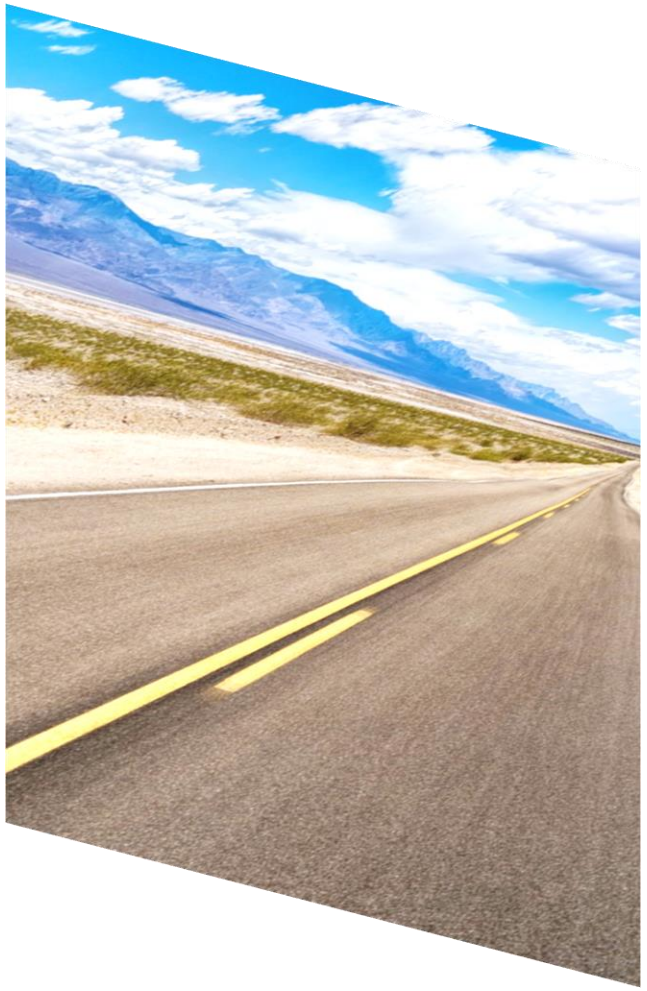
› **<u>Drive</u>**

› Numerical Modelling and other Digital platforms (e.g. Virtual Reality, Artificial Intelligence, Internet of Things, etc.) are key technologies that must be strongly backed up by real plant and experimental validation as well as adequate data inputs.

› **<u>Suggestion</u>**

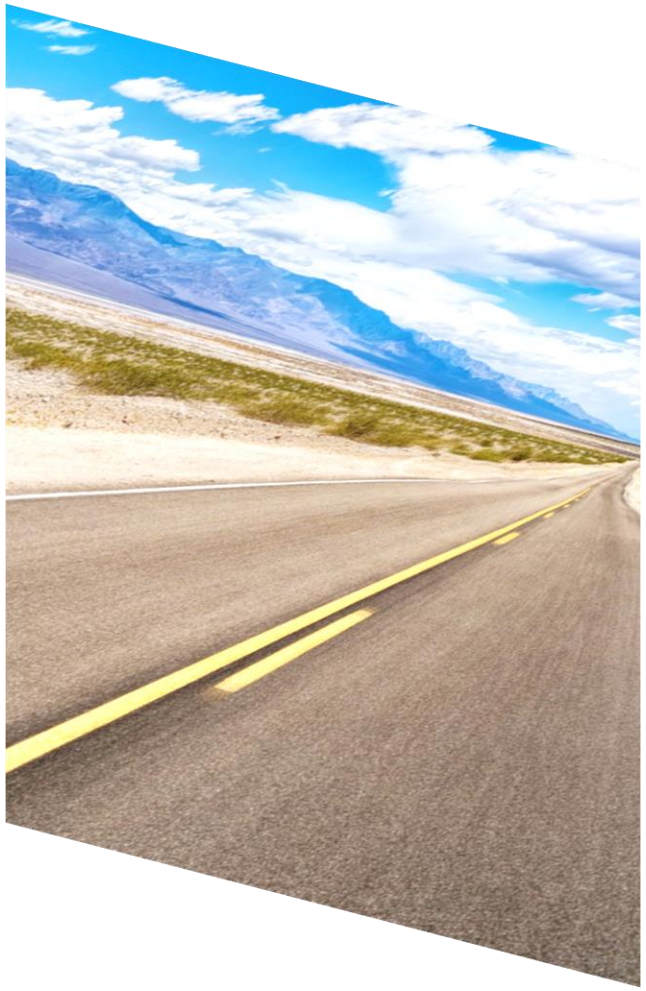
› Actions prioritizing research on Digital twins, online metallurgical models, multivariate analysis for correlation with process conditions and Big Data analysis. This includes thermophysical and chemical properties, open-access databases and product **quality data accessible to all steelmakers**. Focus should be on:

- A database of mould powder properties
- Availability of plant data for validation
- Advanced and specific techniques for determination of thermomechanical properties



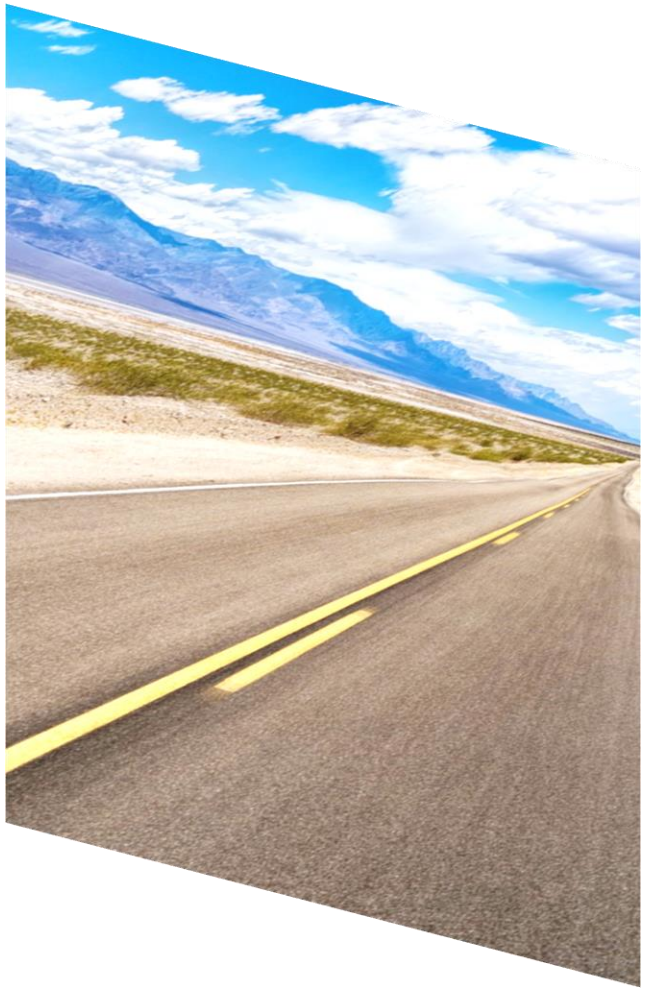
Roadmap 2/5

- **Residual elements**
- **Drive**
- Emphasis on greener steelmaking including a move away from traditional integrated steel plants using the blast furnace route. There will be **a higher use of scrap and more Direct Reduced Iron** (DRI). Therefore, tramp/residual elements will have a greater role in secondary metallurgy, e.g.: Ca and S cause clogging, whereas Cu/CuS have influence on hot ductility.
- **Suggestion**
- Actions capable of addressing challenges arising from Carbon-free and Hydrogen steelmaking, as well as other new steelmaking techniques due to the increase of residual elements. Such actions should target an extension of Actions to study the effect of alternative alloying elements for new generation steels from more economical and sustainable sources also in relation with process conditions.



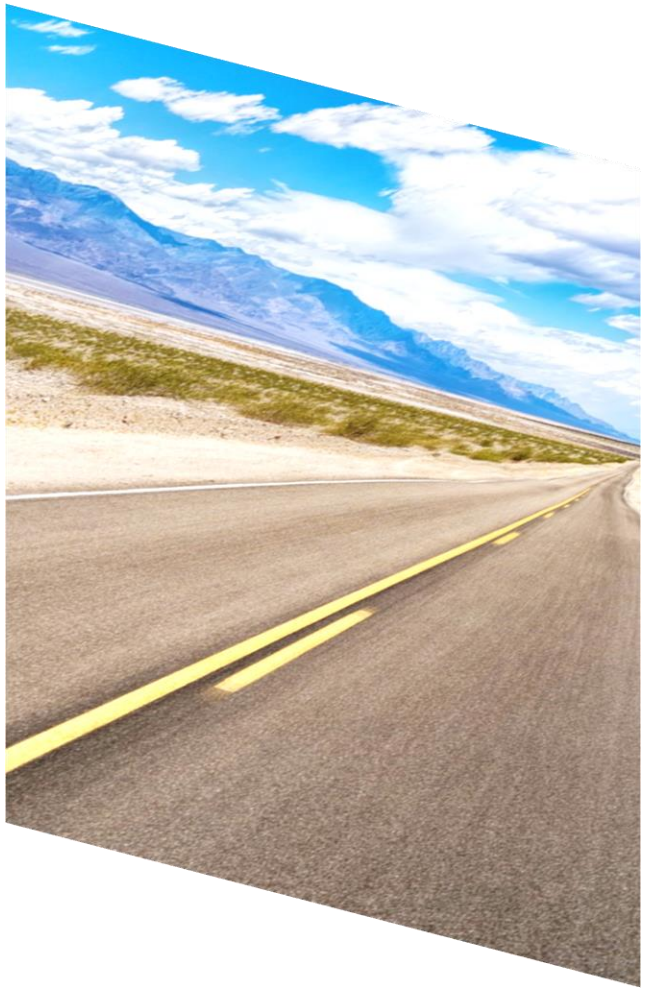
Roadmap 3/5

- **Intelligent sensors**
- **Drive**
- Measurement techniques able to produce tangible savings in yield or improved quality through automated monitoring and inspection of casting conditions/outputs and product quality.
- **Suggestion**
- Actions to develop sensors capable of process control and product monitoring and/or coupling to AI and other digital technologies to suggest corrective actions to cracking and process problems based on machine status and product quality.



Roadmap 4/5

- **Near-Net-Shape Casting**
- **Drive**
- Near-net-shape casting is very important in terms of yield and reduction of waste. However, if there are defects, there is a reduced window for rectification that could mean that more material is scrapped because it cannot be reclaimed or repaired.
- **Suggestion**
- Actions to improve quality to allow the near-net-shape savings to be realised by casting with no rectification and processing to final product with less waste, by improving quality of cast products with a knock-on effect on energy savings and sustainable production.



Roadmap 5/5

› **Dissemination**

› **Drives**

› The pandemic event has impressed remarkable push for change to the ways of communication and the interest in on-line contents has increased and will continue to do so. Webinars are excellent tools for dissemination. In fact, they offer the target audience:

- Significantly reduced investment in terms of time and travel compared to live events.
- Possibility to attend for a part of the day, without greatly impacting on the day-to-day operation, potentially allowing more attendees from a plant representing a greater spread of expertise and interest.

› **Suggestions**

› EC could organise an annual on-line dissemination workshop to present all of that years' RFCS final reports linked with the publication of final project reports.

› These events could also be recorded and kept as an online open access tool.

› Provide an easily accessible, widely distributed forum which allows stakeholders to access up to date and emergent technologies funded by EU projects.

Thank you for your attention!

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