

Thermomechanical Simulation of Continuous Casting in Twin-Belt Caster

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Introduction

- In the Twin-Belt caster, the liquid metal is poured and solidified in the cavity formed by the water cooled belts and dam blocks.
- Achieving high casting speeds and high productivity of steel using twin-belt is quite new in casting industry.

Problem Definition

- A new casting design study is carried out to cast steel alloys in twin-belt caster.
- Ingot must bent to horizontal with minimum bending stresses.

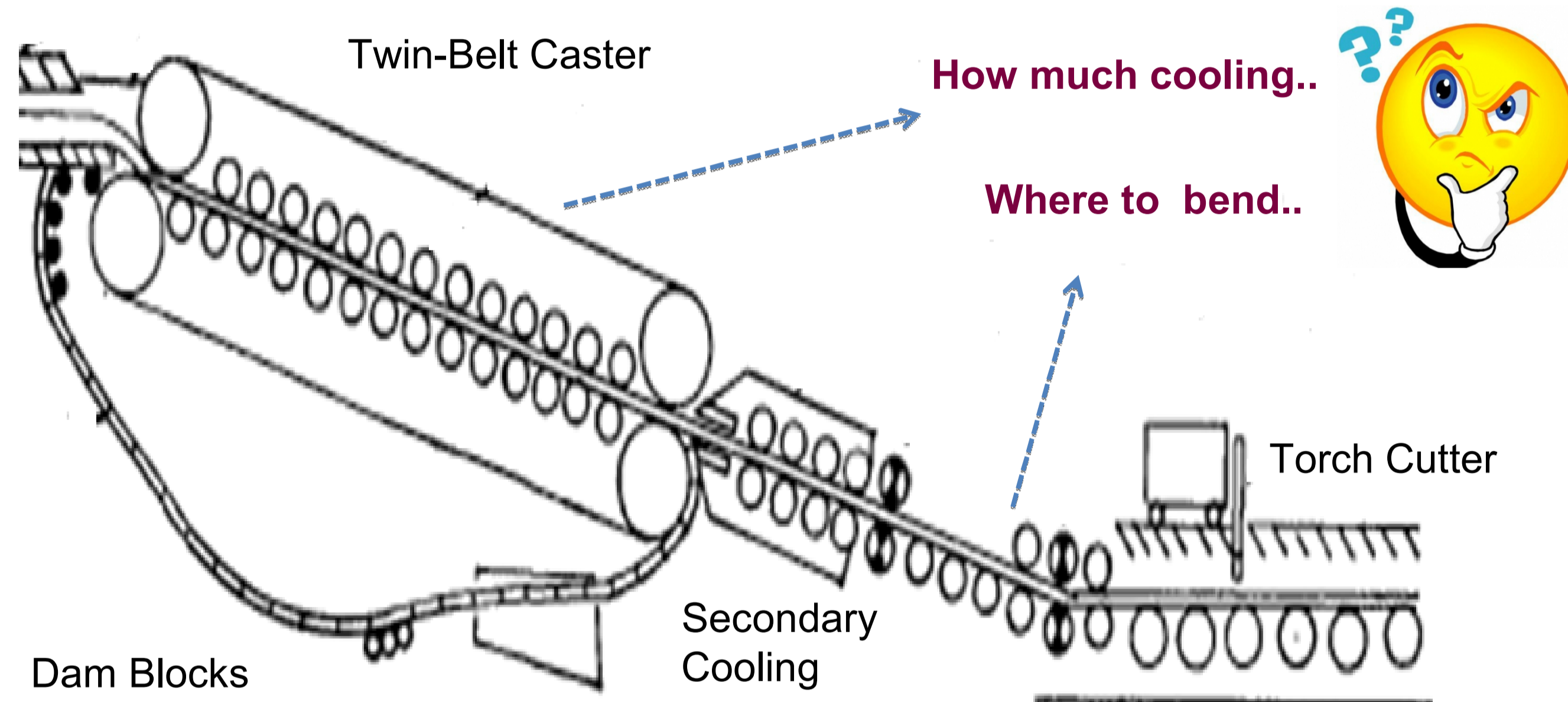
Objectives

- To simulate temperature and stress evolution
- Finding the optimum bending and straightening points
- Minimum Shell thickness at caster exit

Cooperation

Prof. A.Bertram, GRK1554 Member,
Institute of Mechanics

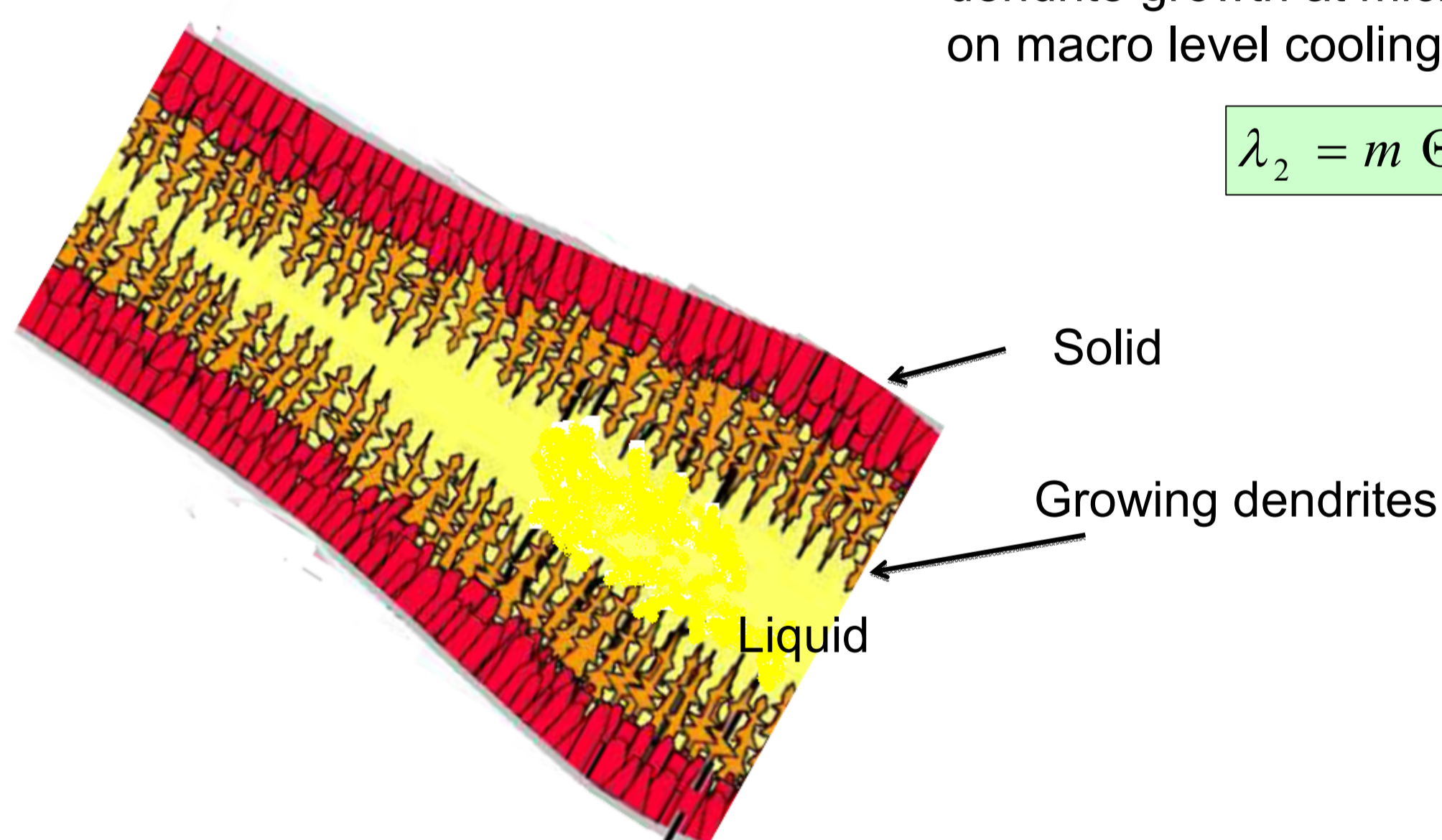
Casting Process



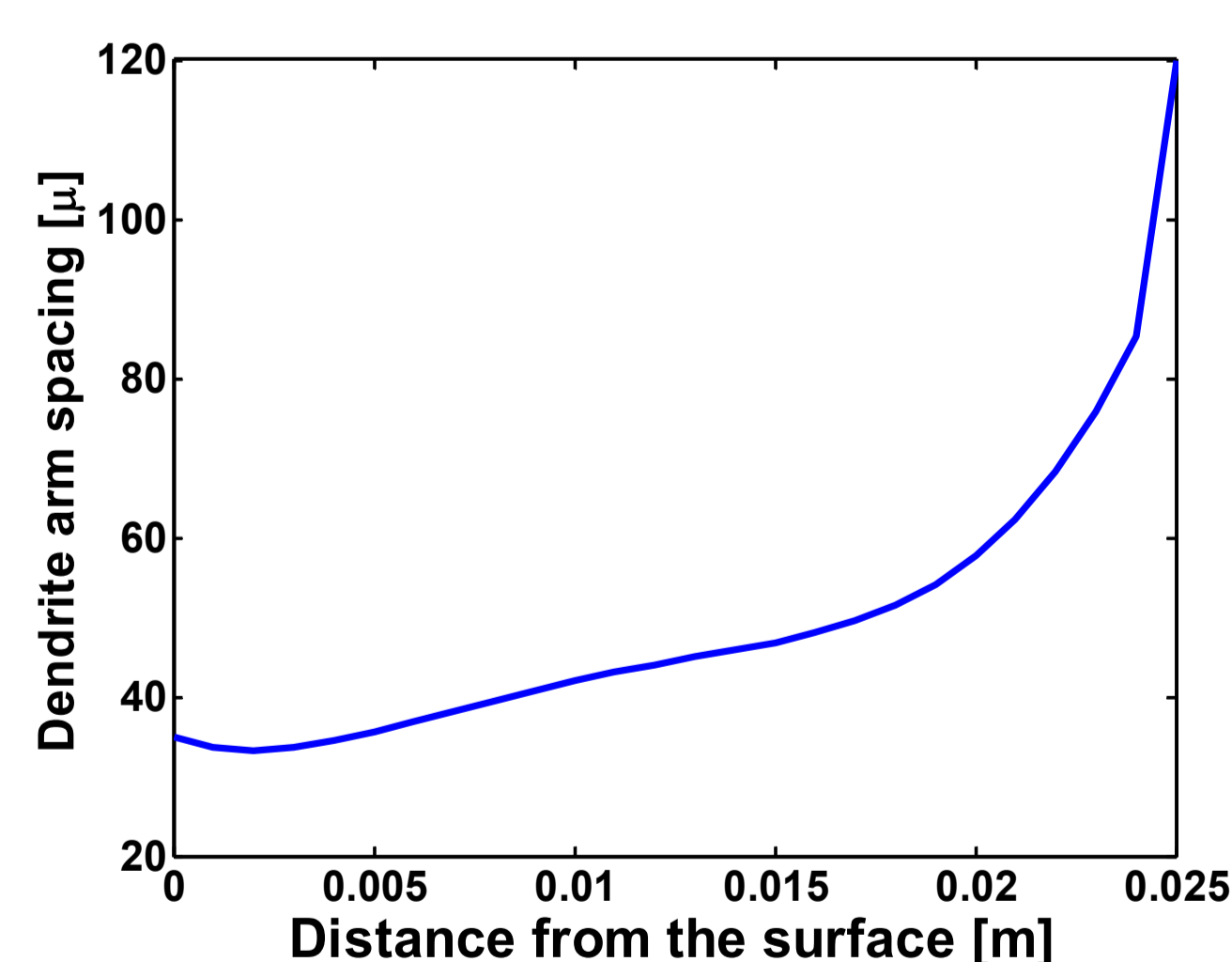
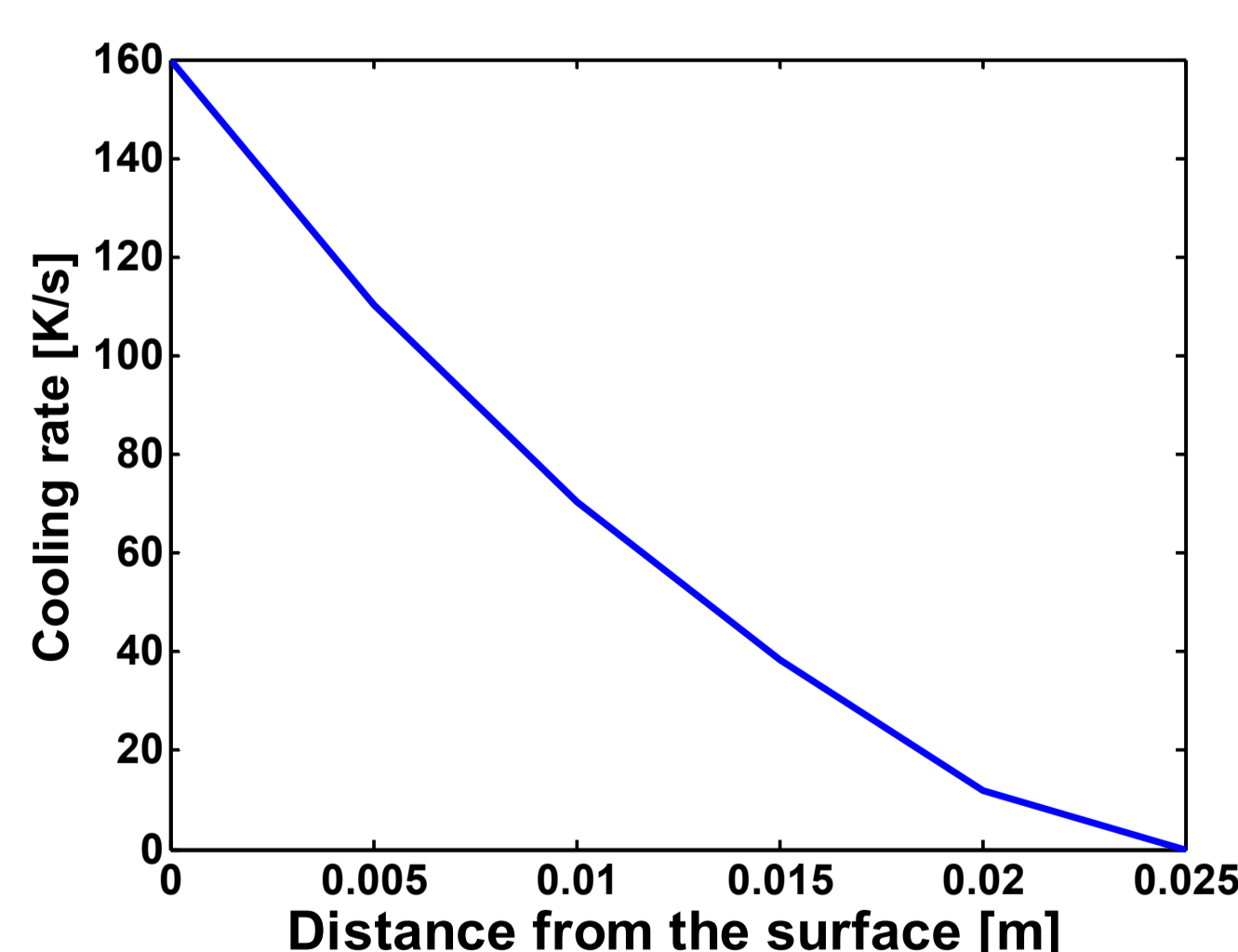
Schematic of the Twin-Belt caster

dendrite growth at micro scale depends on macro level cooling rate.

$$\lambda_2 = m \Theta^n$$



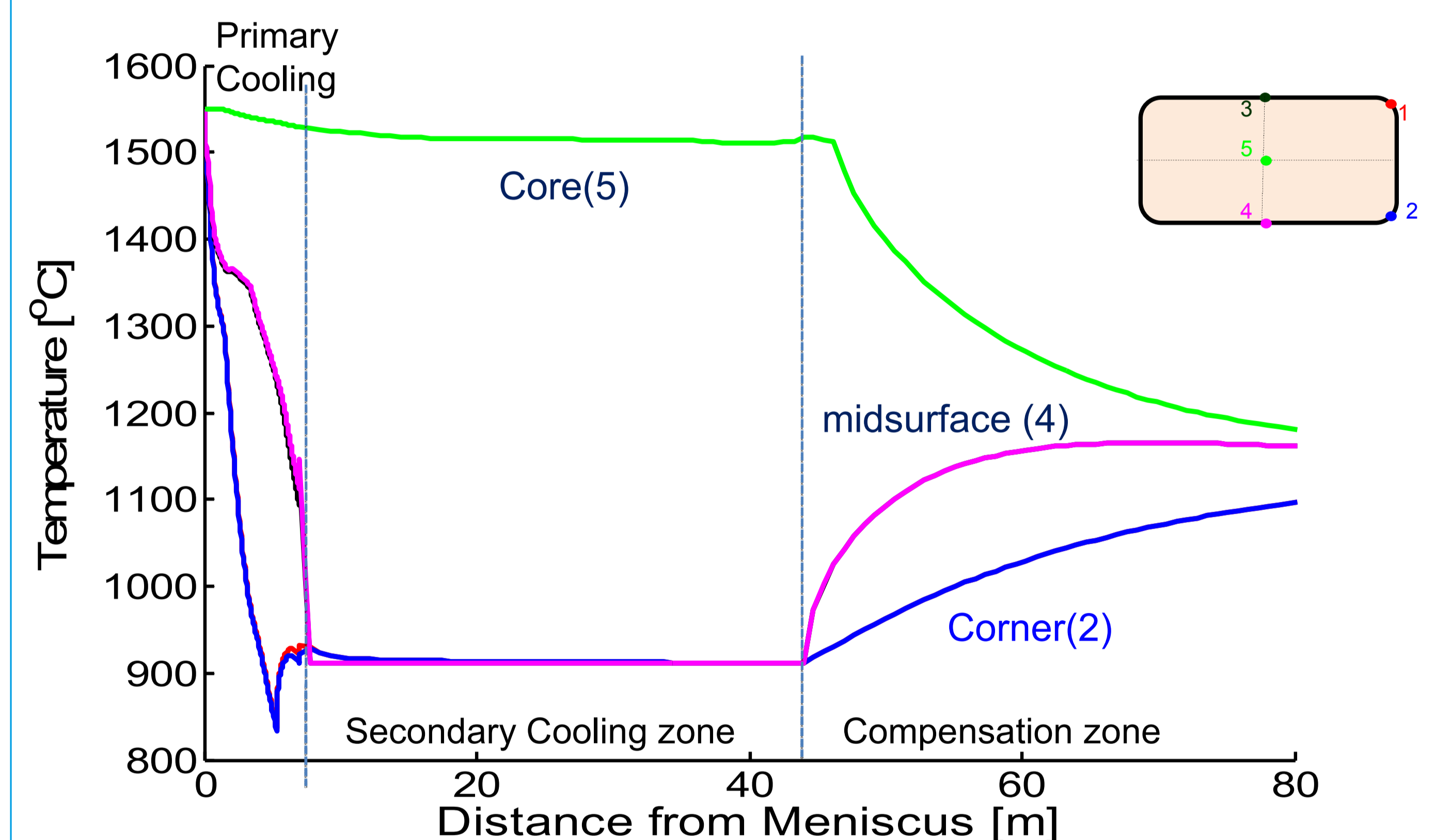
Dendrite growth in the solidifying steel



Analytical Description

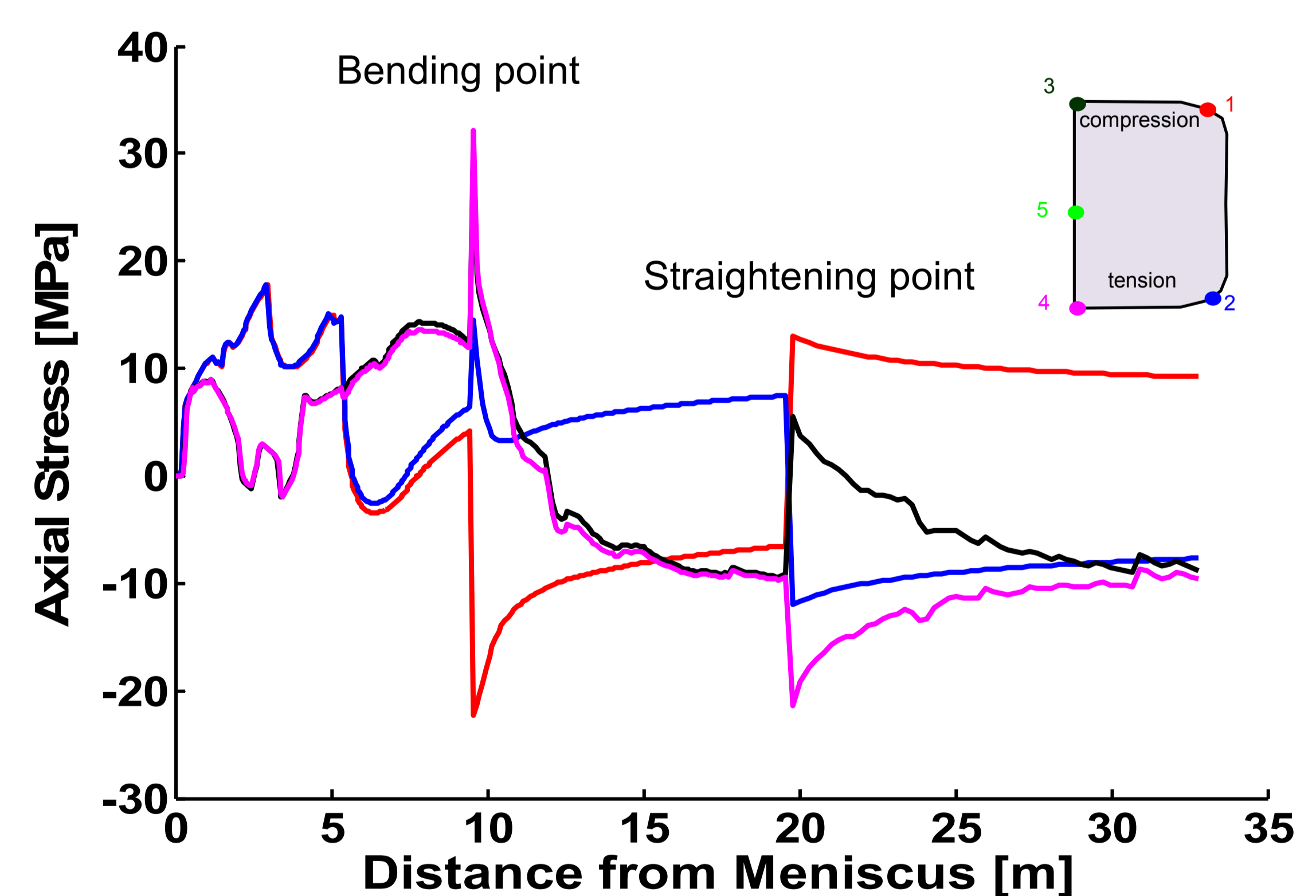
Thermal Solution

The constant temperature assumption is used in the secondary cooling zone.



Temperature profiles in the entire casting process

Mechanical Solution



Stress profiles in the entire casting process

Results and Discussion

- P.K.Penumakala, A.K.Nallathambi, E.Specht, Numerical Heat Transfer Conference, 2012, pp. 311-319.
 P.K.Penumakala, A.K.Nallathambi, E.Specht, A.Bertram, International Conference on Computational Mechanics and Simulation, 2012.
 P.K.Penumakala, A.K.Nallathambi, E.Specht, AIST Steel Properties and Applications Conference, 2012, 575-583.
 P.K.Penumakala, A.K.Nallathambi, E.Specht, A.Bertram, International Conference on Material Modeling, 2013.

Conclusions

The simulation results are applied to implement a new production process at **SWISS STEEL** with the cooperation of **HAZELETT, USA**.