Magnesium Strip produced by Twin Roll Casting

Poster · June 2007

DOI: 10.13140/RG.2.2.17116.08327

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Mg Thin Strip Casting

1. Motivation for Mg Use

- Lightest structural metal
- High specific strength and E-modulus
- Well-balanced mechanical properties of rolled products

2. Aims of the research

- Producing Mg-Strip with little segregation and a good surface quality
- Investigation of the effect of parameters on the quality of Mg-strip
- Developing a CFD-model to study the flow and temperature impact on rapid solidification

4. Results

- Segregation of Al<1% and Zn<0.5%, when roll foce F<100kN
- Roll force and segregation are strongly affected by the variable factors (Tab.2).
- Meltflow- and temperaturfield could be investigated by CFD-Simulation (Fig.2).
- The grain size of as-cast strip is 200µm and after homogenization and hot-rolling reduced to 10 µm (Fig. 3).

Tab.2 Effect of variable factors

	variable factors			aim
	d	v	cc	
roll force	↑	↑	↓↓	↓
segregation	↑	↓	↑↑	↓

3. Experiments

- Horizontal twin-roll-casting of MgAZ31
- Variable parameters (factors) investigated according to Tab.1.
- Using the DoE-method, the number of experiments are reduced from 48 (full-factor-experiments) to 18.

Tab.1 Variable factors and their levels

variable factors	Nr. of levels	levels
d, (gap, mm)	4	3 / 3,5 / 4 / 4,5
v, (casting velocity, m/min)	4	2,5 / 3 / 3,5 / 4
cc, (cooling capacity, l/min)	3	25 / 30 / 35

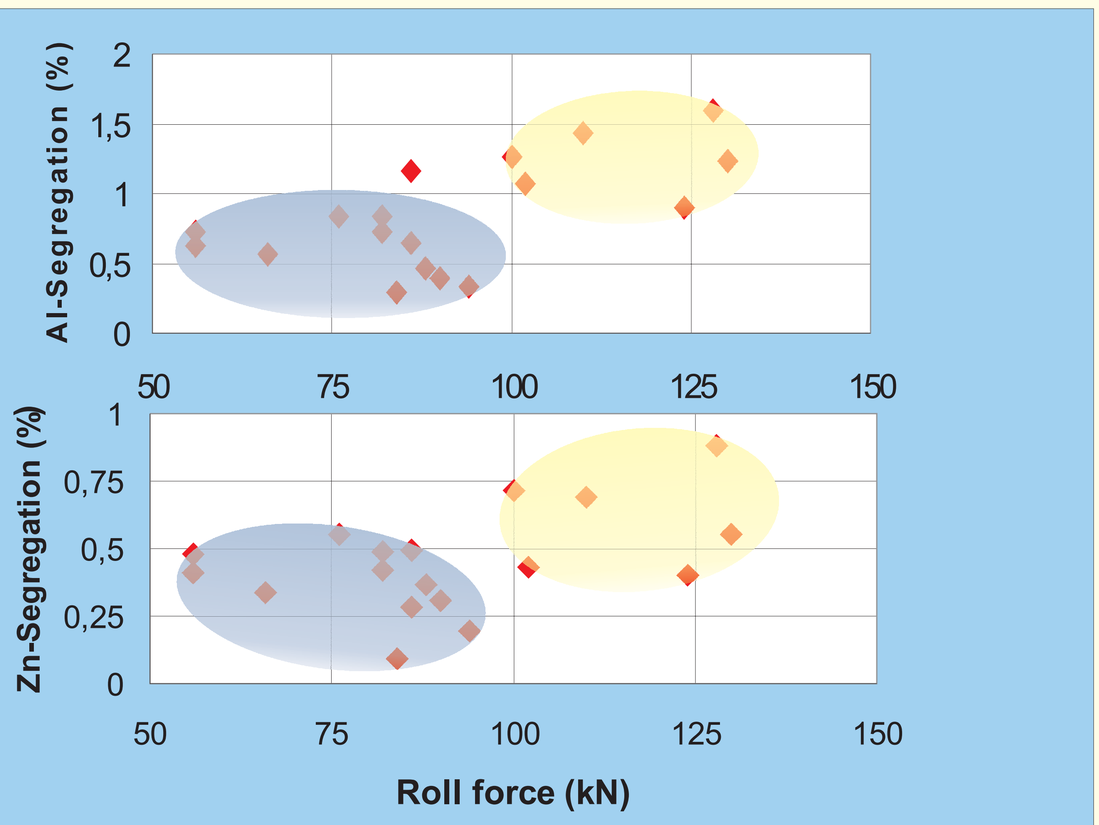
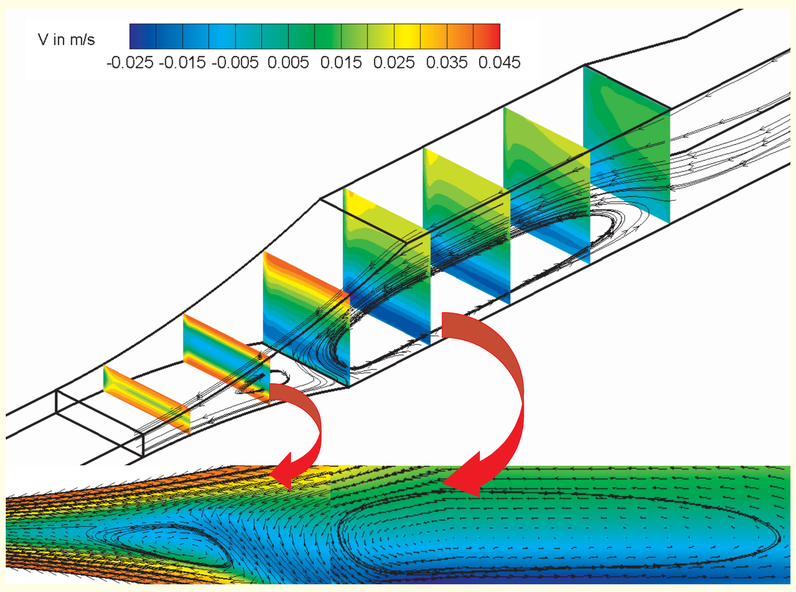


Fig.1 Effect of roll force on segregation



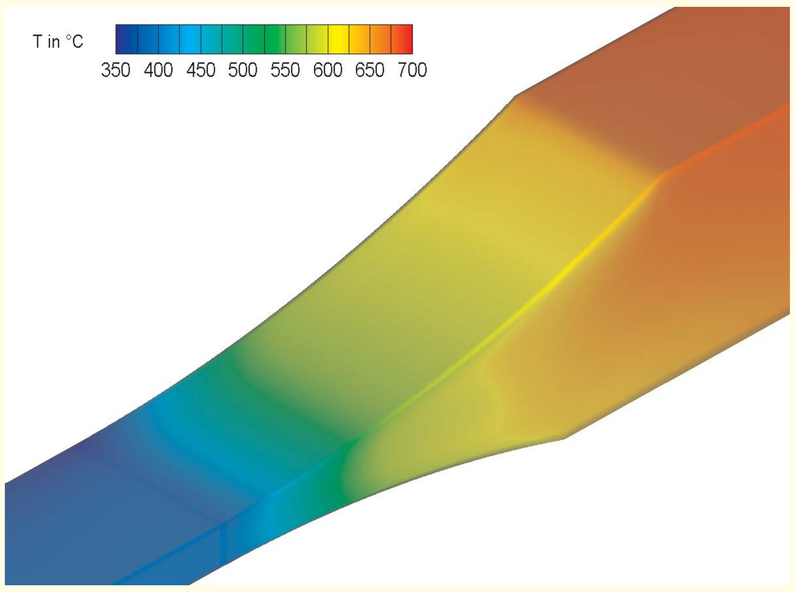


Fig.2 Fluidflow (left) and temperature (right) simulation during twin-roll-casting of MgAZ31

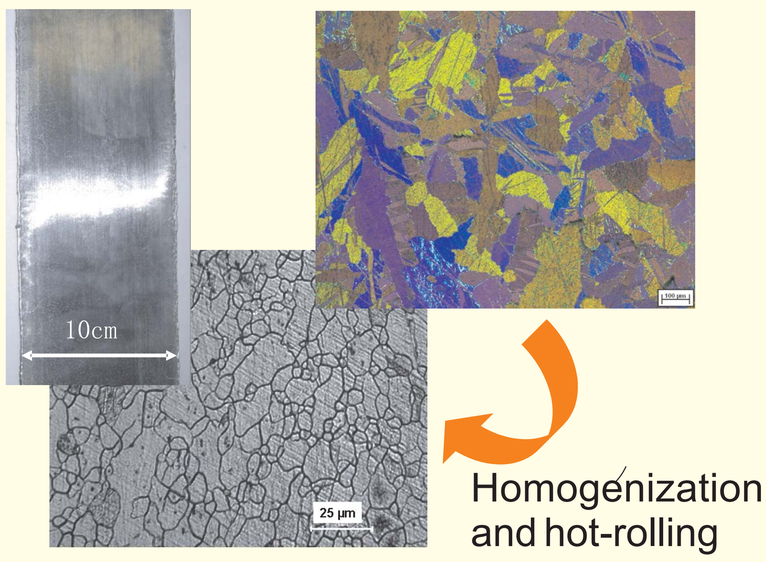


Fig.3 Mg-strip and its micro-structure

5. Conclusion

- A suitable process-window for the production of Mg-strip is determined:
  d = 3 - 3,5 mm, v = 2,5 - 3,6 m/min, cc = 30 l/min
- The flow- and temperature-model for the twin-roll-casting of Mg-strip is developed.
- Mg-strips with little segregation and smooth surface are produced .

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